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ESTIMATING THE EFFECTS OF ECONOMIC CHANGE ON NATIONAL HEALTH AND SOCIAL WELL-BEING

A STUDY

PREPARED FOR THE USE OF THE

SUBCOMMITTEE ON ECONOMIC GOALS AND
INTERGOVERNMENTAL POLICY

OF THE

JOINT ECONOMIC COMMITTEE
CONGRESS OF THE UNITED STATES

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LETTERS OF TRANSMITTAL

JUNE 11, 1984.

Hon. ROGER W. JEPSEN,
Chairman, Joint Economic Committee,
Congress of the United States, Washington, D.C.

DEAR MR. CHAIRMAN: Transmitted herewith for the use of the Joint Economic Committee and other Members of Congress is a study entitled "Estimating the Effects of Economic Change on National Health and Social Well-Being" by Dr. M. Harvey Brenner of the Johns Hopkins University.

This study examines long-term relationships between aggregate measures of economic conditions and social pathology, including mortality rates, physical and mental illness, and criminal aggression. It updates and refines the analysis of a study prepared for the Committee by the author in 1976. Like the earlier study, this work provides policymakers with a basis for assessing the human consequences—and costs to society as a whole—of a particular pattern of economic activity.

Since 1980, the United States has endured back-to-back recessions and the worst levels of unemployment since the 1930s. Currently 8.5 million Americans are jobless. The national unemployment rate exceeded 10 percent for 10 months. At the worst point of the recession nearly 12 million people, or 10.7 percent of the workforce, were unemployed. In two years, unemployment has risen by more than 40 percent and directly touched at least one-fourth of all persons in the work force. Among families with one or more members in the labor force, 29 percent had at least one person unemployed in 1981 and 33 percent had someone unemployed in 1982.

Economists have taken stock of some of the economic costs of recession. Because of idle labor and plant capacity, output of goods and services has run between $250 billion and $300 billion a year below the economy's potential in recent years.

Moreover, recessions can have harmful effects on productivity long after they have technically ended. Investments in both physical and human resources which could add to our productivity in the future are undertaken less frequently in periods of excess capacity. Other productivity losses occur as the skills of idled workers obsolesce.

There may also be long-term damage to the labor market prospects of those out of work—especially persons unemployed for six months or more. Besides experiencing greater trouble finding new jobs, such workers are most likely to take jobs with lower wages and benefits than they had previously. Studies of past recessions suggest that young people in the process of establishing their careers are most seriously impeded by lengthy spells of unemployment. Some of them never catch up. In this recession, the number of long-term unemployed reached nearly 3 million, an all-time high. Over 1 out of 5 of these unemployed persons are teenagers or young adults.

Much of the burden of unemployment is sustained by the jobless themselves. Typically, workers' losses of income are only partially replaced by unemployment compensation and other transfer payments. The financial hardship is frequently compounded by the loss of critical benefits, like health insurance, which were tied to the job.

Joblessness may also subject family relationships to considerable strain. The psychological pressures on individuals are intensified by feelings of failure, guilt over the inability to support their families, and loss of self-esteem. Greater stress may affect the entire household, not just those out of work. The longer this situation endures, the more likely it becomes that frustrations will be vented on the family—or on the rest of society.

Although many transfer programs and social services for the unemployed have been reduced in scope in this recession, the steep increases in joblessness continued to push public expenditures up. At the same time, high unemployment has reduced tax revenues available to all levels of government. At the Federal level, the combined effect on the deficit from those so-called "automatic" tax and spending changes is in the range of $30 billion to $35 billion for each one percentage point rise in the national unemployment rate.

Other costs to society as a whole are harder to quantify. This study, in looking at how particular social indicators vary in accordance with changes in aggregate economic performance, makes a valuable contribution to this process of estimation.

Using data from 1950 through 1980, the study examined the relationship between economic changes and nine indicators of social stress. These indicators include: total mortality rates; cardiovascular-renal disease mortality; cirrhosis of the liver mortality; mental hospital admissions; suicide rates; homicide rates; state prison admissions; total arrest rates; and the incidence of major crimes reported to the police. The principal economic measures are: per capita income (adjusted for inflation); unemployment rates; labor force participation rates; and business failure rates.

Relationships are analyzed for the total population as well as different age, sex, and race subgroups. In tracking these relationships over time, the study takes into account several external factors—such as alcohol, cigarette, and fat consumption—which pose risks to health. As compared with the previous study, the ability to "control" for the influence of these external factors strengthens the interpretation of the statistical findings.

The study found important relationships, comparable in magnitude to those of the earlier research, between economic changes and most of the principal measures of social pathology. As summarized in Table A, for example, the 14 percent increase in unemployment prior to the 1974–75 recession was linked to the following social changes: a 2.3 percent increase in the overall mortality rate; a 2.8 percent increase in the cardiovascular mortality rate; a 1.4 percent increase in the cirrhosis of the liver mortality rate; a 6 percent increase in admissions to state mental hospitals; a 1 percent increase in the suicide rate; a 6 percent increase in total arrests; and a 1.1 percent increase in assaults. Additional increases in social pathology were associated with the 3 percent drop in real per capita income and the sharp rise in business failures which occurred during this period.

TABLE A.—IMPACT OF A 14.3 PERCENT RISE IN UNEMPLOYMENT DURING 1973–74

Pathological indicator	Change related to 14.3 percent rise in unemployment (percent)	Increase in incidence of pathology
Total mortality	2.3	45,936
Cardiovascular mortality	2.8	28,510
Cirrhosis mortality	1.4	430
Suicide	1.0	270
Population in mental hospitals	6.0	8,416
Total arrests	6.0	577,477
Arrests for fraud and embezzlement	4.8	11,552
Assaults reported to police	1.1	7,035
Homicide	[1] 1.7	403

[1] Increases in the homicide rate were found to be related to rising unemployment among males age 16–24, expressed as a proportion of the total unemployment rate.

With three exceptions, these figures reflect the cumulative changes in pathology rates over a six year period. Because chronic diseases take longer to develop and detect, the changes in cardiovascular mortality, cirrhosis mortality, and total mortality were estimated to occur within 16 years. They should be viewed as minimum estimates, since only a subset of possible problems are examined. Moreover, the measures of pathology do not capture some of the less extreme consequences—like nonfatal illness and crimes that do not result in incarceration—that may have been influenced by economic factors.

Naturally, since a myriad of other factors contribute to social pathology, the rates of change associated with the economic measures appear small. But the costs, in human and dollar terms, are substantial. Calculations in this study show that over 45,000 deaths can be attributed to the rise in unemployment that occurred at the onset of the 1974–75 recession and that the drop in real per capita income at that time brought about 60,000 deaths. The increased unemployment in this example was also linked with 270 additional suicides, 8,416 additional admissions to mental hospitals, and 577,477 additional arrests.

In interpreting such findings, it must be emphasized that the study deals only with aggregate relationships. Thus it does not support conclusions about the behavior of individuals: some one who loses a job does not, necessarily, have a greater likelihood of committing a crime or dying from a stress-related illness. However, the findings for the population as a whole suggest that stress induced by economic conditions can lead to shorter life, more illness, and increased aggression for the employed as well as the jobless.

Besides clarifying the human consequences of adverse economic performance, the results of this study can be used to gauge the dollar costs of increased pathology to society as a whole. While the calculations involved are necessarily rough, they point to a wide range of direct and indirect costs associated with unemployment. The magnitudes should underscore to policymakers the importance of keeping unemployment at a minimum.

In 1977, according to a recent study by the Research Triangle Institute in North Carolina, the cost to society of problems related to alcohol, drug abuse, and mental illness amounted to $106 billion. This figure includes both direct expenditures on health care (in hospitals, clinics, nursing homes, as well as physicians' services and drugs) and an estimate of indirect costs—principally the lost or reduced productivity of those who become ill. The latter measure attempts to value the goods and services (including unpaid household services) of which society has been deprived due to illness, disability, or death. While over $88 billion of the total is accounted for by the costs of medical care and forgone income, a variety of other factors—particularly in the case of drug abuse—are economically important: for example, the costs of crimes committed by drug addicts and corresponding outlays of the criminal justice system.

For each of the pathologies considered in this study, similar cost estimates can be obtained. For example, heart attacks and strokes cost the Nation $109 billion in 1975 in medical services and forgone earnings of those afflicted; one year's homicide victims, according to a 1976 estimate by this Committee, would have earned $3.6 billion over the course of normal lifetimes. Of course, only a fraction of the cost in any of these cases can be attributable to economic factors. But based on the increments of additional pathology found by the study to be related to economic changes, an appropriate portion of the cost can be calculated.

Based on changes in unemployment, income, and other conditions in the mid-1970s, Dr. Brenner estimates dollar losses due to recession-related increases in mortality at $26 billion. As shown in Table B. These are resources taken from productive use, which reduce the real wealth of our society. Undoubtedly, the sharper rises in joblessness during the current recession would mean even greater losses now.

TABLE B.—ECONOMIC LOSS IN MILLIONS OF 1980 DOLLARS DUE TO CHANGES IN UNEMPLOYMENT, PER CAPITA INCOME, AND THE BUSINESS FAILURE RATE DURING 1973 AND 1974*

Social stress indicator	Representing economic cost of	Economic loss
Total mortality	Total illness	26,222
Cardiovascular mortality	Diseases of the circulatory system	15,950
Population in mental hospitals	Hospitalization in State and county mental institutions	495
Suicide	Suicide	31
Total arrests	Criminal justice system	1,970
Arrests for fraud and embezzlement	White collar crime	3,061
Homicide	Homicide	137

*Estimates are based on a 14.3 percent increase in the unemployment rate; a 3 percent decline in trend per capita income, and a 200 percent increase in annual change in the business failure rate.

The study thus leaves us with two messages: That changes in unemployment, real per capital income, and other measures of economic performance are correlated with crime, mortality, and a number of physical and mental illnesses. And that a major deterioration of economic conditions will have a pathological impact on hundreds of thousands of people, with a multi-billion dollar cost to society extending far into the future. It is incumbent upon us, in formulating economic policy, to understand these links and to recognize that substantial social costs are preventable.

The study was prepared by Dr. Brenner under the guidance of Mr. William Robinson, Chief of the Education and Public Welfare Division of the Congressional Research Service, and Ken Cahill, Specialist in Social Legislation at CRS. Mary Eccles of the Joint Economic Committee staff also reviewed and coordinated arrangements for this work.

Generally, tables included in the text present research results for the population as a whole, rather than the many different subgroups studied. A representative set of tables with these detailed findings is provided in the appendix; additional tables can be obtained from the committee or the author.

The views expressed in this study are those of the author and do not necessarily reflect the views of the Joint Economic Committee or any of its Members.

Sincerely,

LEE H. HAMILTON,
Chairman, Subcommittee on Economic Goals and Intergovernmental Policy.

DECEMBER 2, 1983.

Hon. LEE H. HAMILTON,
Chairman, Subcommittee on Economic Goals and Intergovernmental Policy, Joint Economic Committee, Congress of the United States, Washington, D.C.

DEAR MR. CHAIRMAN: In response to the request of your committee, I am submitting a report entitled *"Estimating the Effects of Economic Change on National Health and Social Well-Being,"* by Dr. M. Harvey Brenner. The report was prepared by Dr. Brenner under contracts with both the Congressional Research Service and the Joint Economic Committee.

This report is an update and refinement of an earlier study done by Dr. Brenner and published by the Joint Economic Committee in 1976. Among its results, this earlier study found that increases in the unemployment rate were related to the social well-being of the population. Increases in mortality, mental ill health, and criminal behavior were found to be associated with economic instability, as measured by changes in unemployment. Due in part to the very high unemployment rates of the past several years, the committee requested that the Congressional Research Service assist in updating the 1976 study.

The present report both affirms and extends the findings of the 1976 study. Dr. Brenner once again finds that increases in long term real income have beneficial consequences for social wellbeing. Also confirmed are the negative associations between economic instability, particularly unemployment and the business failure rate, and certain aspects of social well-being. In addition, the present study refines the statistical model developed for the 1976 report. Dr. Brenner reports that these refinements both enhance the confidence with which the results can be viewed and extend the research so that new findings are reported.

New results are presented in several areas. Measures of economic instability other than the unemployment rate—decline in labor force participation, decline in average weekly hours worked, and increases in the business failure rate—are reported to be strongly associated with increased mortality. The study shows associations between economic inequality and deterioration in mental health and well-being. Finally, the report presents new evidence on the relationships between pathological conditions and certain risk factors such as alcohol and cigarette consumption, illicit drug use, high divorce rates and the proportion of the population living alone.

Dr. Brenner's study breaks new ground in its development of a sophisticated statistical model of complex social and economic relationships. As with any model of this complexity, the results are profoundly affected by the theory and assumptions inherent in the research design and on which there may be disagreement among experts. We believe that this study, read together with a review of research in the field, "Economic Change, Physical Illness, Mental Illness, and Social Change," prepared by Dr. Jeanne Gordus under contract with the Congressional Research Service, makes a stimulating contribution to the national debate.

We hope this report by Dr. Brenner will serve the needs of your committee as well as those of other committees and Members of Congress.

Sincerely,

GILBERT GUDE,
Director, Congressional Research Service,
Library of Congress.

ACKNOWLEDGMENTS

I thank Carl Christ and Allyn Kimball for technical advice in econometrics and biostatistics, Robert Swank and Rajiv Vohra for computer programming, Mauri Ingram for principal responsibility in data management, and Anne Mooney for review of the manuscript. Intensive examination and recommendations for revision of the report were provided by staff of the Congressional Research Service, including William Robinson, Kenneth Cahill, Charles Ciccone, Dennis Roth, and by Mary Eccles of the Joint Economic Committee staff.

Funding for the application of the basic model to the material of this report was provided under separate contracts with the Joint Economic Committee of the United States Congress and the Congressional Research Service of the Library of Congress. Development of the basic model itself was partially funded by the National Institute of Mental Health, the National Institute on Aging and, most recently, by the Alcoholic Beverage Medical Research Foundation.

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ESTIMATING THE EFFECTS OF ECONOMIC CHANGE ON NATIONAL HEALTH AND SOCIAL WELL-BEING

By M. Harvey Brenner, Ph.D.

I. EXECUTIVE SUMMARY

This study examines the relationships between changes in U.S. economic performance and national measures of social pathology. It updates a 1976 study entitled "Estimating the Social Costs of National Economic Policy: Implications for Mental and Physical Health and Criminal Aggression," prepared for the Joint Economic Committee by the author. The new results reinforce the 1976 findings that high unemployment and other adverse economic developments may have costly social implications.

The 1976 study focused on a period of approximately 35 years, beginning between 1935 and 1940, and ending between 1970 and 1973. The economic and social factors considered in the 1976 study included the delayed effects of the Great Depression, World War II, and the ensuing post-war business cycles.

Data for the current report cover the years from 1950 to 1980. Employing a model that advances the 1976 analysis, the current study takes into account the general economic changes of recent years—the economic growth of the 1960s, the oil price shocks and economic stasis of the early 1970s, and the depressed economy of the late 1970s (and 1980).

Since publication of the earlier report, a major shift in the important causes of death has been emphasized in the research literature. Whereas infectious diseases were the major causes of morbidity and mortality during the period examined in the 1976 report, chronic diseases and external causes such as suicide, homicide, and accidents have replaced them. Certain factors posing a risk to health have also grown more serious. This analysis examines the relationships between certain risk factors and each indicator of pathology; for example, alcohol consumption and cirrhosis; consumption of fat and ischemic heart disease; and the divorce rate and mental hospital admissions.

The new report takes advantage of refined measures of economic distress and social pathology. The unemployment rate, for example, was the only indicator of recession in the 1976 report, with the result that the pathological implications of recession may have been understated. In the current work, additional measures such as labor force participation rates and the business failure rate improve the calculation.

The present study also uses refined numerical estimates of the changes in social pathologies associated with economic change (e.g., the number of additional deaths associated with rising unemployment). The 1976 study made estimates based on a sustained increase in unemployment over a 6-year period. This report estimates the social implications of economic change and other measures over periods ranging from 1 to 15 years.

THE BASIC RESEARCH QUESTIONS

Using new data and advanced measurement techniques, the current study addresses the following research questions:

Will the addition of new data after 1973 (when unemployment levels reached their highest since the 1930s) alter the conclusions of the previous report?

Is economic growth still associated with longer life spans despite the influence of "diseases of affluence" (chronic diseases which result from a high per capita consumption of alcohol, cigarettes and fats) and high levels of environmental toxins?

Do the new, refined methods of measuring the relations under study nullify earlier findings or strengthen them?

Will indicators of recession other than unemployment (such as declines in labor force participation and average weekly hours worked and increases in business failure rates) be associated with increased social pathology?

Will the absence of important factors used in the previous study (the effects of the Great Depression, World War II, and the first post-war recession) alter the basic findings?

After the first post-recession rise in mortality rates, will additional waves of increased mortality be observed?

Are there relationships between measures of social pathology and measures of relative deprivation, as sociological and psychological theories would suggest? Do the relative measures provide a more powerful statistical explanation than those based on economic loss alone?

MAJOR FINDINGS

This study both presents important new findings and reconfirms many of the findings of the 1976 study. In general, the results of the present study are consistent with research findings at the individual, state, and national levels, and with findings in the field of epidemiology, which documents the incidence and distribution of disease in a population. The following sections briefly describe the major new findings, compare them with the 1976 study, and relate them to findings of other research studies which employ different analytic techniques.

1. New Results

The study indicates that economic growth continues to be closely related to longer life spans, at all ages and for both sexes. This remains true despite the influence of health risk factors such as high consumption of alcohol, tobacco, and animal fats and those alterations in the family structure which are associated with increased national wealth.

Equally important results show that several measures of economic recession and structural economic instability are related to mortality. In addition to a high unemployment rate, three other factors—decline in labor force participation, decline in average weekly hours worked, and an increase in the rate of business failures—are strongly associated with increased mortality, and the associations are apparent during a period of 2-3 years or less. Long-term (7-15 years) relationships between economic recession and increased mortality can also be observed.

The study also finds that economic inequality is associated with deterioration in mental health and well-being, manifest in increased rates of homicide, crime, and mental hospital admissions.

Finally, the report presents new evidence on the relationships between pathological conditions and certain risk factors—per capita alcohol consumption (by beverage type); cigarette consumption; illicit drug traffic and use; divorce rates; and the proportion of the population living alone.

A detailed review of the quantitative estimates of the relationships between recession and social pathologies occurring between 1950 and 1980 is presented in Chapter V. Examples of these estimates, when applied to the 1973-1974 recession or, in one case, to 1978-79, follow:

Between 1973 and 1974, the unemployment rate rose 14.3 percent, the real per capita income declined 3.0 percent, and the annual change in business failure rate increased 200 percent.

The increased unemployment rate during 1973-74 is associated with the following: a 2.3 percent increase in the total mortality rate, or 45,936 deaths, from all causes; a mortality rate increase of 2.8 percent, or 28,510 deaths, from cardiovascular disease; a mortality rate increase of 1.4 percent, or 430 deaths, from cirrhosis; a mental hospital admission rate increase of 6.0 percent, or 8,416 persons hospitalized; an arrest rate increase of 6.0 percent, or 577,477 persons arrested; an assault rate increase of 1.1 percent, or 7,035 assaults reported to the police; and a suicide rate increase of 1.0 percent, or 270 known suicides.

The decline in the trend in real per capita income during 1973-74 is related to the following: an increase in the total mortality rate of 3.0 percent, or 59,996 deaths, from all causes; a mortality rate increase of 4.4 percent, or 45,189 deaths, from cardiovascular disease; a mortality rate increase of 2.7 percent, or 806 deaths, from cirrhosis; and a suicide rate increase of 1.11 percent, or 320 known suicides. In addition, the increase in annual changes in the business failure rate is associated with a 9 percent increase in the cardiovascular mortality rate, or 95,680 cardiovascular deaths.

Age-specific relationships are the basis of the overall aggregate estimates. It is therefore possible to cumulate numbers within each distinct category of pathology where the relationships to each of the three economic factors are similar across age groups. A basic similarity in relationships to the three economic factors, for example, exists among age groups in cardiovascular disease mortality. Thus, for cardiovascular disease, the combination of the 1973-74 increase in the unemployment rate, the decrease in the trend of real per capita income, and the increase in the annual change in the business failure rate is related to an overall increase of more than

165,000 deaths over a 10-year period (the greatest proportion of which occurs within 3 years).

Finally, the ratio of youth unemployment (unemployed persons aged 16–24) to total unemployment rates increased by 9 percent between 1978 and 1979. That increase in the youth unemployment ratio is related to an increase in the homicide rate of 1.7 percent, or 403 deaths, by violence.

The 1973–74 increase in the unemployment rate, decrease in real per capita income, and increase in the annual change in the business failure rate are related to more than $24 billion in costs. This figure, explained in the data in Table B, Chapter VI, relies on information derived outside this study. These costs include income lost because of illness and mortality and costs of supporting mental hospitals and the criminal justice system.

INDIRECT RELATIONSHIPS

In the last phase of this study, it was found that unemployment and business failure rates are also related to such health risk factors as alcohol and cigarette consumption and to the proportion of the population living alone. These health risk factors themselves have been shown, in this study, to be related to several of the measures of pathology. The implication is that recession has indirect effects on the pathologies, as well as the direct effects reported above. Experiments indicate that these indirect effects may be substantial. For example, the indirect effects of recession on total mortality may be nearly double the direct effects associated with to the unemployment rate. These experimental results indicate that it will be important for future research to focus on the interactions between economic change, health risk factors, and social pathologies. Such research should permit more precise estimates of the overall relationship between economic change and social pathology to be made.

2. Comparison with the 1976 Report

The present work corroborates the major results of the 1976 study: (1) real per capita income growth is strongly associated with decline in mortality, and (2) recession continues to be related to increased pathology in the areas of mental and physical illness and criminal aggression.

Thus, in the current report, the basic findings on the beneficial impact of long-term economic growth are reaffirmed. The overall mortality rate for all ages, both sexes, and the two major racial groups continues to decrease in relation to long-term increases in real per capital income. Similarly, the importance of the relationship between recession and social pathology can be seen in virtually all the indices of mental and physical illness and criminal activity. The present study re-emphasizes that the unemployment rate is the most reliable indicator of recession-related injury. It is evident, however, that business failure rates and declines in labor force participation rates play substantial roles. The 1976 study found that the basic relationships between recession and pathological measures can take place within a 6-year period. The present study finds that pathological implications of recession may produce results for at least another decade.

3. Agreement with Other Research Findings

The current report confirms results obtained by other researchers which show that individuals of lower socioeconomic status have a high incidence of illness, accidents, and mortality. Psychological disturbances and reported illegal behavior are also more prevalent in low-income than in higher socioeconomic groups.

Findings in the current report are consistent with research that has compared populations by age and major cause of death with respect to socioeconomic differences. Furthermore, the findings reported are consistent with epidemiological literature, which has shown that cigarette consumption, immoderate alcohol consumption, fat consumption, and social isolation are signficant health risks. The recent study also supports research that shows organic chemical toxins to be health risks and illegal drug activity to be a major factor in many different types of crime, especially homicide.

USEFULNESS FOR SOCIAL POLICY

The purpose of this study was to conduct research on the possible pathological effects of unemployment and other forms of national economic distress and to present the findings in a form that will provide useful information for debate on national economic policy. This reporting of the basic statistical relationships between measures of economic activity and measures of social pathology is intended as an early step in the development of a social accounting system that is useful in the assessment of public policy.

This study offers statistical support for the thesis that actions influencing national economic activity have a significant, if not central, influence on physical and mental health and criminal activity. Economic policy decisions, therefore, can be argued to have a substantial effect on many aspects of societal health and well-being.

Policy implications of these analyses can be developed from understanding both the beneficial and detrimental social consequences of changes in economic conditions. Economic measures in this study were selected with specific reference to policy, including some which capture long-term growth trends and changes in the well-being of individuals, and others which portray the capacity of the economy to provide employment to those who seek it.

The pathological indices were also chosen for their significance to policymaking. They are measures of fundamental human unhappiness and non-well-being. Mortality rates are measures of the changing life span. Suicide and mental hospital admission rates are expressions of mental health disorders. Imprisonment and homicide are expressions of acute forms of human aggression. It would be imprudent to disregard social pathologies associated with factors that stem from economic policy. It is clear that the social costs associated with national economic decisions may be substantial.

FURTHER AREAS OF STUDY

We have found statistically reliable relationships between economic growth and long-term improvements in the nation's health and life span. Similarly, we know that recession is related to significant deteriorations in physical health, mental health, and to criminal justice problems. The findings are consistent with comparative research based on both individuals and large populations which show increases in health and social problems and decreased life span in groups of low socioeconomic status.

The quantitative estimates derived in this study express only average population response patterns across time. It would be useful to estimate these relationships at somewhat lower level of aggregation, because conditions can vary greatly by geographic region and urban centers. Different industrial and occupational groups are very differently affected by national recessions and structural economic changes. The responses of certain populations to adverse conditions may be modified by state and local government approaches aimed at ameliorating detrimental social consequences to local groups. High priority should be given to study of those population groups which have been affected by economic change well beyond national averages, analyzing what happens to individuals if possible. Furthermore, it is important to compare relationships found in the United States to those in other industrialized countries, as a means of gathering information about those social policies that are effective in mitigating the adverse consequences of change.

At the level of individual analysis, it would be especially useful to know more about the dynamics of job-related stress experienced by workers during periods of economic crisis or uncertainty. Survey studies of populations experiencing sharp economic fluctuations could reveal important information about the effects of fluctuations on physical and mental health and potential for criminal behavior. The emphasis on large national population samples is necessary in order to examine severe but less frequent conditions and for the statistical control of traditional risk factors.

II. OVERVIEW

SETTING THE PROBLEM

Severe disturbances to the economies of industrial nations during the past decade have raised the issue of the relationship of a growing and stable economy to health and social well-being. To what extent can national well-being be damaged, or at least fail to improve, in a climate of extraordinarily high rates of unemployment and inflation, structural decline in manufacturing employment, and increased regional disparities in wealth and economic development?

Epidemiologic observations have consistently demonstrated that differential mortality and morbidity rates are related to socioeconomic status at the individual level (*1*), to gross national product at the national level (*2, 3*), and to high rates of unemployment and of workers earning low income in county and metropolitan areas (*4, 5*). As national economic growth declines, mortality rates increase. Conversely, it has been documented for various periods in the United States (*6*) and other industrialized countries (*4, 7*) that the mortality rate declines following long-term economic growth.

In the fall of 1976, the Joint Economic Committee of the U.S. Congress published a study of the impact of economic change on levels of mental and physical health and criminal aggression (*8*). This study, using measures of economic growth, inflation, and unemployment, showed consistent statistical associations between increases in unemployment rates and increases in measures of social pathologies. Considerable other research has shown the association between unemployment and risks to physical and mental health (*9–13*), as well as to increased rates of imprisonment (*14*).

The objective of the current study is to indicate a potential impact of national economic policies on major social problems, including a decline in mental and physical health and an increase in illegal activity. In order to estimate the national importance of facts known only through small samples based on individuals or on specific regions, data from large national samples would be appropriate. Large samples would also assure that relatively infrequent conditions such as death and severe illness are accounted for, and that controls can be developed for those risk factors that affect societal problems independently of economic policies.

Since large national samples were not available, we used a two-step approach. In the first step, research findings and scientific formulations developed at individual and regional levels of analysis are brought together and applied to the national level. In the second step, the national-level analysis is designed so that it accounts for the short-, medium-, and long-term implications of economic changes.

THE MAJOR HYPOTHESES

The Economic Change Model of Pathology was designed by the author to account for the impact of changes in the economy on physical and mental health and illegal activity. The model has five basic elements: long-term economic growth, economic instability, economic inequality, factors associated with economic growth which pose risks to health, and random shocks.

1. Long-Term Economic Growth

By making available increased resources or wealth per capita, long-term growth fosters social well-being and increases in life span. Such growth spurs societal investments in new knowledge (for example, concerning medical care) and in education of the population. It also provides the basis for improved working conditions, including the development of health and safety measures, and for increases and improvements in leisure and social insurance.

2. Economic Instability

Economic instability encompasses recession and structural economic changes that are damaging to certain groups in society. In times of economic instability, loss of employment and income occur with unusual frequency. Economic instability is marked, therefore, by high rates of unemployment and business failures and by declines in labor force participation and declining returns to investment for the individuals affected.

Under these conditions, the income levels and socioeconomic status of certain individuals and groups are lowered. Downward mobility, or the threat of it, and the attempt to re-establish socioeconomic position frequently involve considerable psychological and economic harm to the people involved. Employees of firms whose existence is threatened because of significant economic losses are also adversely affected.

3. Economic Inequality

Economic inequality relates to the distribution of the product of economic development. For reasons which usually depend on structural change in the economy or on social custom, specific groups may not gain—or may actually experience loss—while the rest of the population takes part in the process of economic growth.

4. Health Risk Factors

Economic growth may alter consumption and production activity in ways that are deleterious to health. Examples are immoderate alcohol consumption, abuse of prescription or illicit drugs, cigarette smoking, regular consumption of foods that are high in fat content, environmental contamination with chemical toxins, and substantial increases in the number of motor vehicles in the population. Another problem linked to growth is social isolation: divorce or solitary living arrangements may also impair health.

5. Random Shocks

Random shocks are disturbances in the natural or social environment that have the potential to damage a population's well-being. These include disasters such as floods, tornadoes, earthquakes, epidemics, internal political or economic disturbances, and rapid demographic changes.

DERIVED HYPOTHESES

The principal hypotheses which are derived from the Economic Change Model of Pathology are as follows: (1) economic instability, economic inequality, special risk factors associated with economic growth, and random shocks are detrimental to a population's health and social well-being; (2) conversely, economic stability, some measure of increased economic equality, minimization of risks associated with economic growth, and the absence or control of random shocks coincide with trends fundamentally beneficial to a population's health and social well-being.

Specific hypotheses which can be derived from this general framework include: (1) as long-term economic growth increases, overall mortality rates decrease; (2) as the unemployment rate increases, mortality rates increase and the incidence of social pathologies is greater; (3) as labor force participation and average hours worked in manufacturing industries decrease over the short run, mortality and social pathology rates increase; (4) as the business failure rate increases, the mortality rate increases and individual health and well-being decline.

The major hypotheses are discussed in more detail in Chapter IV.

SELECTION OF MEASURES

The purpose of this study is to translate research findings on beneficial and pathological effects of economic growth and recession into a form that is useful in assessing national economic policy decisions. The underlying analysis relates several measures of social pathology to major indices of economic stress.

We cannot offer overall estimates of the relationship between economic change and mental health, physical health, or aggression. To do this we would need to take into consideration the extent of total morbidity (in the cases of mental and physical health) and the total incidence of aggression in society (in the case of illegal activity). Date on the incidence of general illness which could be appropriately used for this study have never been available, nor have we had any but the barest and most questionably reliable data with which to estimate criminal behavior. We are therefore unable to measure the totality of the phenomena directly, but must instead rely on estimates from a variety of indirect sources.

1. Measures of Social Pathology

Measures of social pathology, which represent fundamental aspects of well-being, were chosen for their policy significance. Trends in the overall mortality rate are measures of the changing life span. Cirrhosis and cardiovascular-renal disease mortality rates are negative measures of the physical health of the population. The suicide rate and mental hospital admission rate are negative mental health measures. Measures of the incidence of criminal aggression reflect disturbances in the social environment.

A. GENERAL HEALTH MEASURES

i. The total mortality rate, specified by age, sex, and race
ii. The cardiovascular-renal disease mortality rate, by age and sex
iii. The cirrhosis mortality rate, by age and sex

We face a complicated problem in measuring changes in the nation's health status. There appear to be no uniformly gathered estimates of health status over sufficiently long periods of time to permit comparisons with changes in the state of the economy. Moreover, those estimates which do exist have not kept pace with medical diagnostic criteria of ill health. We are therefore limited in our estimates to the most severe indication of ill health—mortality.

The advantages of using mortality as an index substantially outweigh the disadvantages. Those states which have registered deaths since 1900 provide reliable estimates of the rate of death over time. In fact, mortality data are the "hardest" demographic data available for use in the biological and social sciences. Furthermore, these data can be compared according to the specific components of age, sex, and race, thereby providing comparisons of the reactions of certain groups to environmental changes. Finally, the data on the causes of death are reasonably reliable for large categories such as cardiovascular-renal disease or infectious diseases. These data are available for many different countries; they are also available from each U.S. state, allowing comparison with estimates for the country as a whole.

Perhaps the major disadvantage of using mortality as a national health index is that, over the last several decades, increased life span has been associated with a greater probability of morbidity due to chronic diseases (*25*).

B. MENTAL HEALTH MEASURES

i. Rate of admission to psychiatric hospitals, by age
ii. The suicide rate, by age
iii. The cirrhosis mortality rate, by age and sex

We do not measure the national "mental health level" directly by using these three measures to reflect changes in the overall mental health of the population. Rather, we assume that, by using the combined estimates obtained, we can infer (imperfectly, we admit) changes in the overall mental health status of the population. In doing so, however, we rely on measurements of the most extreme behavior for which society keeps a continuous record.

One example of the use of data on extreme behavior is our utilization of the rate of admissions to mental hospitals over time to indicate changes in the overall mental health level of the population. Such a procedure has the disadvantage of being somewhat confounded by administrative problems related to the hospitalization of the mentally ill (for example, admissions policies in hospitals with limited space and numerous applicants). It has the advantage, on the other hand, of representing a relatively severe indication of change as well as the tolerance of the population for serious mental disturbance.

Related measures such as suicide rates and cirrhosis mortality rates are used to supplement data on mental hospital admissions. (Cirrhosis is also used as an indicator of physical health.) The suicide rate is indicative of severe mental distress. Fluctuations in the incidence of cirrhosis-related deaths would indicate the extent of severe alcohol abuse. If the relationship between mental hospital admissions and changes in the economy accurately reflects the effects of the economy on societal stress, we should obtain similar findings for suicide and cirrhosis-related deaths. The mental hospital admission rate may be more generally reflective of the overall level of societal mental distress, however, because suicide and cirrhosis are infrequent compared with hospitalization for mental illness.

Among the mental health measures, therefore, we have selected those which represent intellectual and affective disturbance, inability on the part of the family and community to deal with mental disorders outside the institutional setting, and the use of psychotropic substances to alleviate mental health trauma. These measures cover, conceptually, a number of broad mental health problems and, taken together, generally reflect the overall mental health of the population.

C. MEASURES OF CRIMINAL AGGRESSION

i. The rate of imprisonment in state prisons
ii. The rate of arrests, by age
iii. The major crimes known to police, by type

Estimating changes in the incidence of criminal aggression is at least as difficult as obtaining comprehensive indices for mental and physical health.

Imprisonment is used as an index of extreme forms of societal aggression, an indication of criminal behavior serious enough to warrant incarceration by the state for the protection of the public. As an indicator of societal aggressions, imprisonment has the disadvantage also of being influenced by changing standards of criminal correction, the effects of plea bargaining, and public finance considerations. Although imprisonment is a relatively indirect measure of the extent of aggression within society, it is nevertheless fairly reliable as a measure of the presence of societal aggression.

Measures of criminal activity drawn from criminal justice sources include the rate of arrests for all offenses, ranging from relatively minor charges such as drunkenness to serious crimes of aggression and violence. Narcotics arrests are singled out for particular attention because of the overall damage to social health and well-being represented by illegal narcotic activity. Arrests for embezzlement and fraud, as a measure of overall white collar crime, have been thoroughly analyzed because of their extraordinary monetary cost to society. Moving closer to the actual incidence of criminal behavior, we examine the rate of crimes reported to police for six of the serious offenses: assault, burglary, larceny, robbery, rape, and automobile theft.

Homicide is used as a supplementary measure of aggression. It is drawn from vital statistics rather than from criminal justice sources, and therefore does not depend on the criminal justice reporting system. In the same way that suicide and cirrhosis mortality rates lend validity to mental hospital admission estimates of mental health, homicide rates serve as a supplementary measure to rates of imprisonment as an indication of change in the extent of aggression in American society. Both homicide and imprisonment have shown patterns similar to those of mental health measures in relation to disturbances in the economic environment.

In each of the topic areas in which social measures have been selected—physical health, mental health, and illegal activity and aggression—key policy issues are involved. This study provides statistical evidence for each of these measures, of direct and indirect relationships to national economic policies, which bears attention. In many instances, national economic changes are linked to social problems that have entailed considerable expense to society.

2. Economic Measures

Economic measures were chosen for their relevance to both policy and to theories of how economic factors may influence pathological phenomena. Furthermore, economic measures distinguish between trends in long-term economic growth and short-term, or cyclical, fluctuations.

A. MEASUREMENT OF LONG-TERM GROWTH TRENDS

i. Growth of per capita income

The most significant measure of economic growth, the trend[1] in per capita income, is related directly to the material well-being of individuals. In estimating the exponential trend in "real" growth, we take into account the rate of inflation.

B. MEASUREMENT OF CYCLICAL FLUCTUATIONS

i. The unemployment rate, by age and sex
ii. Short-term declines in labor force participation and in hours worked in manufacturing industries
iii. The business failure rate

These measures were selected to portray the capacity of the economy to provide employment to those who seek it. The principal index is the unemployment rate, a key measure of cyclical changes in the economy. In both the 1976 report and the current study, this measure is interpreted as a multidimensional measure of stress, indicating loss of work, loss of income, and damage to self-esteem and social relationships. In many cases we found it useful to specify unemployment rates by age and sex, rather than use the total unemployment rate.

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[1] The "pure" trend element of long-term economic growth tends to have an exponential form. We therefore fit an exponential trend to the real per capita income, thus eliminating the cyclical component, which is measured by the variables discussed in the section on cyclical fluctuations.

The 1976 study used only the unemployment rate in estimating effects of recession, a factor which may have served to understate the overall pathological implications. In the present study, additional measures of recession are used to capture the widespread nature of the current economic stress. For example, the measurement of short-term declines in labor force participation documents the activity of persons who have dropped out of the labor force because of retirement or discouragement. The rate of business failures is another powerful indicator of recession which depicts the economic impact particularly on members of the middle class.

Although we now have several indices with which to measure the adverse impact of periods of economic instability on individual health and well-being, we still lack a totally comprehensive measure of cyclical effects.

How To View Results

The statistical analyses performed for this study identify relationships between economic and social measures. They cannot be used to demonstrate causality. The results only establish that certain factors vary in similar fashion and appear to be statistically linked.

In the present study, tests for the statistical significance of findings are routinely performed to reduce the possibility that the relationships occur by chance (Tables I–III and Appendix Tables 1–33). Also of relevance is how systematically the same results are found among sub-populations of the study sample. Consistent sets of relations by age group and sex, by cause of death, and by category of mental hospitalization and crime are reported in detail in Chapter V. These results are in agreement with those of other studies (Chapter III), and, in general, our theoretical expectations about the relationships between economic change and social pathology are borne out by the findings (Chapters III and IV).

Returning to the issue of causality, it is possible that various unidentified external phenomena are responsible for the changes being observed between the factors. In this case, economic and social factors could be jointly related to other, unobserved factors which produce the results. Our research cannot rule out this possibility.

We can, however, examine whether some external factors which are influenced by economic conditions—such as alcohol, cigarette, and fat consumption per capita, and social isolation—also influence health. If such risks to health are taken into account, are the same relations between economic conditions and health and social well-being still observed? We have found that, controlling for these factors, the relations between economic conditions and measures of health and well-being are usually strengthened rather than weakened.

We conclude, therefore, that although they do not prove the existence of causal relationships, our findings provide considerable statistical support for the hypothesis that economic recession is related to adverse change in national health and well-being.

To interpret the study's results properly it is necessary to understand that aggregate data are being used. This presents a minimal problem in the case of relations based on "simple" factors, which have one meaning for both the individual and the entire population. Such simple factors include per capita alcohol, cigarette, and animal fat consumption. Compound factors such as economic instability are multidimensional and are measured by several variables which have different implications for different individuals—income loss, employment loss, increased work stress, home foreclosure, and forced migration. During a period of national economic instability, individuals will not experience the same types or same combinations of adverse circumstances. Thus, the measures of economic instability—rates of unemployment, labor force participation, and business failures—represent more than they measure directly.

Lag Structure

We find that increases in mortality rates, mental pathology indices, and criminal justice indices can be observed within a 6-year period during and after recession. Based on previous research in the United States and other industrialized countries, we expected, and found, that there are two characteristic peaks in the relationships within that 6-year lag period. The first of these peaks occurs during the first year of the recession and presumably reflects: (1) sharp psychological reactions to substantial economic loss, such as can be seen in the suicide rate, in the mortality rates of highly vulnerable populations, and in criminal justice indices, and (2) decline in nutrition and use of medical care, which can affect infant mortality and mortality among the chronically ill.

The second peak typically occurs 2 to 3 years after a recession (as measured at the highest level of the unemployment or business failure rates). Though chronic disease (especially cardiovascular disease) mortality is especially involved, nearly all sources of illness and social pathology are implicated. The 2- to 3-year peak reflects a period of continued economic loss for the population that loses socioeconomic status as a result of recession. This sequence can be observed by examining standard economic indicators.

The 6-year interval of increased mortality associated with recession is understood to reflect, in part, increases in the incidence or severity of chronic illnesses which in some instances result in mortality. It is assumed, however, that most persons whose ill health is aggravated by recession do not die within a 6-year period of recession. Rather, the seriously ill population becomes more vulnerable to mortality over at least the subsequent decade. With total and chronic disease mortality, therefore, we find relationships between recession and mortality over a 16-year period.

RESULTS

In this section as throughout this report, expressions such as "related to" or "associated with" are used to mean that statistically significant relations were found between measures of economic change or health risk factors and social pathologies—without inferences to the cause and effect of the relationships.

The principal findings of this study reflect the premises of our general model. Specifically, the long-term trend of economic growth has a beneficial association with total mortality for all ages, particularly with respect to cardiovascular disease and suicide. Economic instability, as measured by the unemployment rate, has an adverse relation to total mortality at all ages, with lags under 5 years and usually over a period of 7 to 15 years. The same pattern of statistical relationships is reflected in the findings for cardiovascular diseases (especially ischemic heart and cerebrovascular disease) and cirrhosis of the liver. Suicide is related to unemployment with lags under 2 years, as is homicide for children of both sexes at ages 1 to 4 (probably reflecting child abuse) and for women over the age of 45. Imprisonment, arrest rates in all age groups, and serious crimes reported to the police are all associated with increased unemployment rates within a period of 6 years.

Business failure rates, a second measure of economic instability, are strongly related to mortality in persons over the age of 55 with lags of under 3 years. Cardiovascular mortality rates show this relationship even more clearly (especially at younger ages), and even within 1 year, similar relationships are observed for suicide rates of middle-aged groups. Decline in labor force participation, another measure of economic instability, is associated, within a year, with increased mortality of infants and of the population aged 20 to 24 and over 55. Declines in labor force participation by women are related to suicide rates of women over the age of 35.

Economic inequality, as measured by the discrepancy between unemployment of specific population groups and that of the population at large, is related to homicide, mental hospital admissions, and imprisonment. Regarding homicide, the ratio of youth unemployment to total unemployment is an especially prominent factor. The ratio of unemployed persons over age 65 to total unemployment is an important factor in psychiatric hospitalization, while the non-white unemployment ratio bears a strong relation to state prison and state mental hospital admissions.

Other variables have also been found to be related to measures of health and social well-being. Alcohol consumption per capita is related to virtually all the measures of pathology. It is necessary, however, to consider the principal beverages separately: for example, beer consumption per capita is clearly related to decreases in cardiovascular mortality, especially in ischemic heart disease mortality. On the other hand, cigarette consumption per capita is uniformly related to increased mortality in persons over the age of 35 and in infants, and for all diagnostic categories of cardiovascular disease. Social isolation, as indicated by the divorce rate and by the proportion of the population living alone, is related to increases in mortality in several age groups as well as suicide, mental hospital admissions, and officially recorded criminal activity.

The relationships between economic changes and measures of societal pathology are discussed in Chapter V and are presented in detail in Tables I–IV and the Appendix Tables. Although the analyses are based on relationships during the years 1950–1980, approximately, we can estimate their quantitative implications for specific recessions. In Table A we estimate the relations of specific economic indices to measures of social pathology for the recession beginning in 1973-1974.

TABLE A.—ESTIMATED IMPACT[1] OF A 14.3 PERCENT INCREASE IN UNEMPLOYMENT RATE, 3 PERCENT DECLINE IN TREND PER CAPITA INCOME, 5.5 PERCENT INCREASE IN BUSINESS FAILURE RATE, 200 PERCENT INCREASE IN ANNUAL CHANGE IN BUSINESS FAILURE RATE

[All actual changes between 1973 and 1974[2]]

Social stress indicator	Increase in stress incidence related to									
	Rise in unemployment rate		Fall in real income trend		Rise in business failure rate		Rise in annual change in business failure rate		Rise in ratio of unemployment rate of males in age group 16-24 to total unemployment rate	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total mortality	45,936	(2.3)	59,996	(3.0)	2,682	(0.1)				
Cardiovascular mortality	28,510	(2.8)	45,189	(4.4)			95,660	(9.0)		
Cirrhosis mortality	430	(1.4)	806	(2.7)						
Suicide	270	(0.98)	320	(1.1)						
Population in mental hospitals	8,416	(6.0)								
Total arrests	577,477	(6.0)								
Arrests for fraud and embezzlement	11,552	(4.8)								
Assaults reported to police	7,035	(1.1)								
Homicide[3]									403	(1.7)

[1] Direct effects only; estimates of indirect effects are discussed in Chapter V.

[2] Equations based on the years 1950-1980.

[3] Homicide figures refer to change of 9 percent in the youth unemployment ratio between 1978 and 1979.

Note: Figures in parenthesis indicate percent of total stress incidence.

Between 1973 and 1974, the beginning of a national recession, the unemployment rate increased by 14.3 percent, the trend in real per capita income fell by 3.0 percent, the business failure rate increased by 5.5 percent, and the annual change in the business failure rate increased by 200 percent. In Table A, the social implications of these economic changes are estimated for total mortality; mortality due to cardiovascular diseases, liver cirrhosis, suicide, and homicide; mental hospital admission rates; and criminal indices which include the total arrest rate, the rate of arrests for fraud and embezzlement (white collar crime), and the rate of assaults known to police.

In the case of total and chronic disease mortality—cardiovascular and cirrhosis mortality—the unemployment impact is estimated within a 16-year period. For all other indices of social trauma the unemployment impact is estimated within a 6-year period. The increase in social trauma associated with the decline in the real per capita income trend is estimated within 1 year; that of increased business failure rates and annual changes in business failure rates is estimated within a 3-year period. Table A shows, for example, that the increased unemployment rate is related to: an increase of 45,936 deaths (or 2.3 percent) within a 16-year period. The per capita income trend decline is related to an increase of 59,996 deaths (or 3.0 percent) within 1 year. The increase in business failures is related to an increase of 2,682 deaths (or .10 percent) within 3 years.

Table B provides dollar costs associated with the changes in unemployment rates, trend of real per capita income, and business failure rates during 1973–74. Table B is derived from calculations in Table A of the percentage of changes in social pathologies that are linked to changes in the economic indices. The social pathologies are taken as indicators of more general societal problems. Thus, total mortality serves as an indicator of total illness; cardiovascular mortality indicates morbidity due to circulatory system disease; arrests for fraud and embezzlement indicate white collar crime, etc. The economic costs of the societal problems, indirectly measured by the social pathology indicators, have been derived from independent studies discussed in detail in Chapter VI. Those economic costs are multiplied by the percentage changes in social pathologies related to economic conditions to produce the economic losses of the 1973–74 economic changes reported in Table B.

TABLE B.—ECONOMIC LOSS IN MILLIONS OF 1980 DOLLARS ASSOCIATED WITH [1] A 14.3 PERCENT INCREASE IN UNEMPLOYMENT, 3 PERCENT DECLINE IN TREND PER CAPITA INCOME, 200 PERCENT INCREASE IN ANNUAL CHANGE IN BUSINESS FAILURE RATE [2]

[All actual changes between 1973 and 1974 [3]]

Social stress indicator	Representing economic cost of	Economic loss related to				
		Rise in unemployment rate	Fall in per capita income trend	Rise in annual change in business failure rate	Rise in ratio of unemployment rate of males in age group 16–24 to total unemployment rate	Total
Total mortality [4]	Total illness	$11,371	$14,851			$26,222
Cardiovascular mortality [4]	Diseases of the circulatory system	2,685	4,256	$9,009		15,950
Population in mental hospitals	Hospitalization in State and county mental institutions.	495				495
Suicide	Suicide	14	17			31
Total arrests	Criminal justice system [5]	1,970				1,970
Arrests for fraud and embezzlement.	White collar crime	3,061				3,061
Homicide [6]	Homicide				$137	137

[1] Direct effects only; estimates of indirect effects are discussed in Chapter V.
[2] Impact on population in mental hospitals is for 1979, for suicide for 1978.
[3] Equations based on the years 1950–80.
[4] Costs of total and cardiovascular illness estimated at a 2.5 percent discount rate. For estimates at 10 percent discount rate, see chapter VI.
[5] Assuming that trends and fluctuations in total arrests reflect those in overall crime, the related overall crime cost would be $10,880 million.
[6] Homicide figures refer to change of 9 percent in the youth unemployment ratio between 1978 and 1979.

It should be pointed out that the social and dollar costs of recession are "direct" in the sense that they influence health and criminal indices when control factors such as alcohol and cigarette consumption and divorce and the population living alone are held constant. The "indirect effects," which are based on the influence of recession on these control factors, and, subsequently, on health and criminal activity, have been studied experimentally. The experimental results indicate that the indirect effects of recession are probably much greater than the direct effects of the unemployment rate (see Chapter V on Indirect Effects).

Social Costs and Social Policy

This report deals with the basic relationships between national economic conditions and measures of social pathology. If these findings are to be of use to policy makers, they need to be translated into the costs associated with changes in social pathologies.

If the intent of national policy making is to bypass concerns of slow economic growth, instability and recession in favor of long-term economic prosperity, then the following should be considered. First, whatever the success of long-term policy, if current economic growth is damaged, or recession is deepened or prolonged, one can be reasonably confident of substantial social costs. If the long-term approach turns out to be correct, then there may be net social gains over the long term, but there will also have been sacrifices borne by specific populations in the short run. On the other hand, if long-term policy is incorrect, then it is possible that the costs based on current considerations will not be offset; indeed, it is likely that they will be increased.

If policymakers consider that long-term economic policy will, in fact, override current costs and benefits, the results of the present study emphasize the need for caution, for several reasons. First, there is no consensus among the leaders of the economics profession regarding the appropriate path toward sustained prosperity. Second, the existing models of national economic behavior are rarely precise in forecasting beyond the short term—a year or two into the future. Third, because of domestic and international political considerations, it is not certain that resulting economic policy formulations will have the anticipated effects. Such uncertainties about long-term economic policy planning make it clear that overriding short-term economic considerations may incur substantial costs to society.

Beyond the promotion of real economic growth and curbing of recession, the Economic Change Model of Pathology presented in this report is applicable to other types of social policy. It is generally assumed that severe economic inequality and structural unemployment are undesirable. The data of this report substantiate those assumptions by showing that economic inequality is related to poor physical and mental health and to increased criminal activity. Structural unemployment—especially of youth—is associated with mental health and criminal justice problems.

Our information on government spending for social programs indicates that government spending on Aid to Families with Dependent Children (AFDC) is significantly related to declines in mortality of infants and 1- to 4-year-olds. It is also possible to infer some of the effects of diminished social welfare spending during recession. We observe that health problems of many different types, ranging from infant mortality to chronic diseases and mental health, substantially increase during periods of economic recession. Some would argue that a period of recession is therefore a period during which it is most urgent to debate increased supplements to income, nutrition, and health care.

Table B summarizes specific social costs in monetary terms. More specific discussions of these data can be found in Chapter VI.

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III. HISTORICAL BASIS OF THE MODEL

INTRODUCTION

Probably no subject in social epidemiology has been as long and thoroughly studied as the relationship between socioeconomic status and health (*29, 149, 150*). Until very recently, the bulk of research in this area has been concerned with establishing a strong statistically significant relationship between low socioeconomic status and mental and physical disorders. A high incidence of physical and mental pathologies has been found in groups with low socioeconomic status.

Given the consistent findings of the substantial literature at the individual level, research turned to a specific measurement of the distribution of illnesses in the population. Higher morbidity and mortality rates and higher incidence of ill health were identified in low socioeconomic groups that included nonwhites and the elderly. Mental disorders such as schizophrenia occurred with the highest frequency in the low socioeconomic groups. Furthermore, there is evidence of a relationship between socioeconomic status and reported crime, although this association is less satisfactorily worked out than others.

To understand the dynamic relationship between economic levels and health, further advances were required in research design. Specifically, it was necessary to demonstrate with a certain level of statistical probability that a change in health status would follow a change in the economic status of a person or population. To facilitate this end, researchers began to look at the variables in the context of nations or large aggregate groups in order to identify the dynamics involved and the relationships between them.

INDIVIDUALS AND SOCIOECONOMIC STATUS

a. Epidemiology of Illness

Important social epidemiological studies in the United States have long provided evidence of the relationship between low socioeconomic status and pathology. The conclusion was that socioeconomic status per se, rather than residential area or ecological niche, was the crucial variable in social deviance in general, and in physical and mental pathology specifically (*147,* pp. 28–29).

Further research on the subject of individual and economic change has shown consistently that groups of low socioeconomic status exhibit a high incidence of mental and physical disorders and criminal aggression. These include higher rates of morbidity and mortality due to ill health (*23–39*); a large number of mental disorders (*40–56*); and a high incidence of illegal activity (*143*).

When the welfare state was introduced in Britain after World War II, income distribution was equalized to some extent, and social and medical services were made more available. Nevertheless, substantial differences in disease patterns continued to exist among the socioeconomic groups in that country. Indeed, overall mortality rates have continued to be high for the lower socioeconomic groups, both in Britain and the United States (*29*), since that time. In the United States, moreover, the infant mortality rate and the communicable disease death rate for white infants have declined far more sharply than have those for non-whites (*30*); the sharp declines seem to be due, in part, to difference in income and education.

In the United States, the comparatively poor disease patterns of low socioeconomic groups and non-whites have been most evident in chronic conditions as reported in the National Health Survey (*31*). Hypertension (*32*) and cancer of the lung, cervix, stomach, and esophagus (*33*) are among the principal chronic diseases related to low socioeconomic status.

The high morbidity and mortality rates of individuals of low socioeconomic status can also be observed among the elderly. The number and severity of disabilities for older persons in the lower social classes is high, and, largely for these reasons, fewer of them continue to work after the age of retirement. The lack of food and relatively poor preparation of food among the lower-class elderly have been documented, as have inadequate housing, housekeeping services, and nursing care (*38,39*).

b. Health Care Utilization

Seriously compounding the problem of higher rates of severe illness and mortality among lower socioeconomic groups is that they tend to delay more than their counterparts in higher socioeconomic groups in seeking medical care. Numerous studies show that people with low incomes tend to seek physicians' services in hospital emergency rooms and clinics, presumably because their illnesses have reached emergency conditions or because they have had no regular source of primary physician care (*69, 79, 85, 88–89, 94–95, 98, 101, 105, 107–109*). People with the lowest incomes have the lowest rates of surgery (*68–69, 73–74*). High-income groups are more likely to use preventive services, especially children of high-income families (*67, 68, 73, 76, 78, 84, 89, 90, 101–102, 105, 108, 110–114*). In addition, high-income persons use more services of specialists (*69, 82, 94–96, 99, 101, 108*) and seek more preventive services from dentists than do low-income persons (*88, 101, 103, 115*).

Traditionally, research has indicated that low-income groups use physicians' services and are admitted to hospitals less often than high-income groups. These relationships are being reversed, however, because of the growth of health insurance and financing programs for the poor (*67–106*). Low-income persons still stay in the hospital on average longer than high-income persons, probably indicating greater rates of severe illness (*68–69, 71–74, 79–83, 86, 88, 91, 93–94, 96, 99, 100, 103, 105–106, 116*), but both high- and low-income groups seek physicians' services for serious illness at similar rates (*68–69, 84, 108–109, 117–118*).

Poor health care and related practices appear to be closely connected with morbidity and mortality patterns. In Britain, low-income groups have made less use than high-income groups of services to improve health, including hospitals (*34*), prevention and immunization facilities, maternal and child health services, and dietary supplements (*35*). Similar findings of disadvantage to the health of lower socioeconomic groups continue to be observed for the United States. In the United States, in addition, the problem of access to health care, both because of the absolute costs and the organization of medical services, appears to have a more serious impact on low-income than on high-income persons (*36–37*).

c. Mental Disorders

Major differences among socioeconomic groups are also found in the case of mental disorders. Despite the many unsolved problems of selecting reliable and valid indices for measuring mental disorders, every measure shows that lower socioeconomic status tends to be highly correlated with poor mental health (*40*). Only a few studies among a great many on this subject do not show a greater prevalence of mental disorders in the lowest socioeconomic groups (*41–42*). The relationship between high rates of mental disorders and low socioeconomic status holds regardless of whether the studies used surveys of subjective reports of happiness, standard psychiatric inventories, psychiatric examinations, or interviews by psychiatrists (*43–47*). The findings are similar in studies involving the incidence of all types of psychiatric care (*48*) or first admissions to mental hospitals (*49*).

The incidence of schizophrenia, especially in larger cities, occurs mainly among low-income groups. The incidence of psychoneuroses and personality disorders is also prevalent among groups of low socioeconomic status. The distribution of the depressive disorders, however, may be unrelated to social class groupings (*50–56*).

d. Social Disorganization

The relationships between socioeconomic status and crime, delinquency, family disorganization, and alcoholism have been worked out less satisfactorily. This is most likely due to the lack of precise measures in these areas of social pathology. Nevertheless, as was noted above, they tend to predominate in areas with low-income populations. In addition, many studies indicate that lower-class individuals run greater risks of being defined as criminal or delinquent (*57–59*). Again, numerous studies indicate an inverse relationship between socioeconomic status and divorce rates (*60–62*), desertion (*62–64*), and illegitimacy (*65*). Finally, there is substantial evidence of increases in heavy consumption of alcohol, and debilitating problems related to such drinking, commensurate with decreases in socioeconomic position (*66*).

In the literature described above, there are no extant cohort studies of living populations in which both the economic and health conditions of individuals were measured through time. Rather, these studies described a point-in-time relationship between low economic status and relatively high morbidity and mortality rates and contributing factors, such as utilization of health services.

POPULATIONS AND THE OVERALL ECONOMY

The central value of macro-level studies of the influence of economic disturbances on health lies in their ability to gather information from large populations over both long and short time spans. The pre-eminent question of how important the health implications of economic change may be is answerable only by the macro study, since it is geared to estimate the impacts on the population of communities, cities, provinces, nations, and aggregates of nations. The macro-level studies also allow us to study differences in responses to economic disturbance according to culture, political system, economic system, and type of industrial development.

Populations and Economic Development: A Static Picture

Empirical research testing the relationship between economic growth and health status depends on suitable data from comparisons among populations at different levels of economic development—either for the same society over time or for different societies. Such studies usually measure health levels by mortality-based indicators—crude death rates, infant mortality rates, or expectation of life at birth. Recent analyses of death rates over various time spans in the 20th century in the U.S. (*151*) and Britain (*152–153*), for instance, show strong association between trends in increased per capita income and decreased mortality rates for all causes, infant deaths, and cardiovascular disease. Cross-sectional studies of samples of both industrial and developing countries corroborate results of the longitudinal studies. Levels of mortality decline and life expectancy rises with higher levels of income or GNP (*154*, pp. 1903–1905; *155*).

Preston's (*155*) analysis of 50 to 60 countries in the 20th century shows a relationship between increased per capita national income and increased life expectancy, with more gain in life expectancy per dollar income in the 1960s than in the 1930s or 1900s. The result illustrates an important characteristic of the basic association between health and economic change—the basic relationships can be found under many circumstances, but the strength, form, and conditions of the relationships are likely to vary with changes in time and place.

Populations and Economic Change: A Dynamic Picture

A. ECONOMIC HISTORIES

Studies of the effects of economic adversity on mortality rates began with the observation that after the 18th century in northern Europe, the mortality rate declined sharply (*119*). Furthermore, the decline in mortality rates had been measurable long before the introduction of sanitation, large-scale quarantine methods for immigrant groups, or medical technologies such as inoculation and chemical therapeutics, especially the sulfonamides. It is now generally accepted that the extraordinary increase in life expectancy that occurred during the 18th century in northern Europe was largely a function of the control over agricultural productivity (*120–121*).

Major technical advances in agriculture, generally first attributed to Britain, were observed to diminish the amplitudes of the cycles of abundance and famine which were known to be closely related to the levels of mortality associated with major epidemic diseases and plague (*120–121*). Indeed, the 19th century in northern Europe saw a decline in mortality which resulted in both a doubling of the life span and an extremely sharp decrease in mortality rates attributed to infectious diseases. The "industrialization" of agriculture continued into the 20th century. In industrialized countries, infectious diseases ceased to be a significant cause of mortality in all age groups.

B. INDUSTRIALIZED SOCIETY VERSUS DEVELOPING COUNTRY

So significant is the influence of economic development per se on mortality and morbidity levels that, on an international basis, the most significant source of life expectancy differentials is clearly related to the level of economic development. In developing countries, mortality rates, especially infant mortality rates, are comparatively high, and diarrhea, respiratory illness, and infectious diseases are mainly responsible for morbidity and mortality. In contrast, in industrialized countries, the major sources of mortality are chronic diseases and external causes (accidents, homicide, suicide) in the younger age groups. The major changes in life expectancy and patterns of disease incidence reflect very long-term or secular changes in the productivity of the economy that are the result of industrialization in both agriculture and manufacturing (*122*).

It has been suggested that the result of the transfer of public health and medical care measures from developed countries to certain low-income countries is that survival is now more clearly statistically dependent on social policies than on national income. Whatever importance the transfer of technical advances may have, however, it has not, it is argued, altered the basic income-health relationships (*151–155*).

It must be noted that relating trends in economic indicators to health status is far more complex for industrialized countries. In the first place, the effects of long-term trends in national productivity and income must be considered distinct from those of cyclical changes in the economies of countries where production and consumption patterns are not planned, i.e., non-socialist countries. Second, a major problem in analyzing the effects of economic change on morbidity and mortality concerns the probability that the decline in health status will lag behind the decline in the national economic indicator. A third concern involves the precise mechanisms whereby adverse changes in the economy may increase the population morbidity level. The methodological problems are discussed in more detail in the *Research Concerns* section of this Chapter.

Despite the differences in kinds of data and in methodological considerations, the empirical evidence strongly supports the relationship between national economic indicators and health in industrialized countries (*147*). For both infectious diseases and infant and maternal illnesses, strong relationships have been observed between an increase in national economic growth and a decrease in mortality rates (*135*). The decrease in mortality due to the chronic diseases has also been found to have a strong relationship to national economic growth in industrialized countries (*133–135*); these chronic diseases include heart, cerebrovascular, and renal diseases which comprise the majority of sources of mortality in these countries. Finally, increases in rates of hospitalization for mental disorders have been shown to be strongly related to adverse national economic fluctuations (e.g., unemployment rates), as have mortality due to cirrhosis of the liver, automobile accidents, and suicide and homicide (*129, 130, 139*).

C. POPULATIONS AND ECONOMIC INSTABILITY

With these findings as background, an additional series of studies was undertaken over the last 5 years to determine the overall effects of changes in the national economy on health status. Given the consistent findings of the substantial literature on the subject, there was reason to believe that declines in employment and income, and increased inflation, would decrease the actual socioeconomic status of significant minorities of the general population. Those decreases in socioeconomic status, in turn, would lead to lowered levels of nutrition, a substantial increase in social-psychological stress, and decreased financial access to medical care facilities. These three factors, originating in national economic instabilities, would then have a substantial negative impact on the health of the population.

Economic downturns have potentially damaging influence on health because they entail change for many members of a population and loss of social status for some, often those of the lowest social status. Most research on the health effects of business cycles has analyzed national or state populations with mortality rates as the measure of health levels. Recently, however, measures of morbidity and utilization of health services have become more frequent, especially in studies of mental disorder.

Earlier analyses had dealt with mortality from all causes, infant mortality, suicide, and deaths resulting from heart disease and tuberculosis (*156–159*). With the exception of tuberculosis, which over the last 50 years has declined in importance as a cause of death in industrial countries, these causes are still attracting the attention of researchers. Later research followed the earlier work in demonstrating that unemployment rates are directly related to mortality rates, with lags of 2 to 5 years, particularly when long-term economic growth is also controlled (*160*). But at the same time, another business cycle indicator, measuring the rapid pace of economic growth, was also related directly to mortality.

In periods of economic instability, economic loss and downward mobility lead to expansion of the socioeconomic differentials. This means socioeconomic status of some populations is lowered. Recent reports from Britain (*161–162*) and the U.S. (163–165) continue to show a strong relationship between socioeconomic status and measures of morbidity and mortality, often with a particularly large gap separating the lowest social stratum from the rest of the population.

Interpretation has typically focused on such intervening variables as living environments, occupational hazards, nutritional status, and access to health care. As economic growth has contributed directly and indirectly to improvements in these conditions, even for the poorest, the data have been regularly tested for indications of convergence of health status among groups of different socioeconomic status. Researchers in the U.S attempted to determine whether improved economic conditions had elevated the health status of the poor. Although convergence has been reported (*149, 164, 166–167*), the gains are not necessarily maintained. In fact, there have recently been reports of absolute as well as relative deterioration in the health status of lower socioeconomic groups (*162*) during periods of economic growth.

RESULTS OF ECONOMIC CHANGE

a. Loss of Resources and Psychological Stress

The two principal ways in which adverse economic changes, specifically unemployment, can affect health are, directly, through the reduction of material resources, and, indirectly, through psychological stress. Loss of resources is associated particularly with infectious disease and in fetal and infant health problems related to inadequate nutrition, housing, and energy. In societies where access to medical care is not universally guaranteed, reduction in income will lead to a decline in or postponement of, health care utilization. In the U.S. for instance, reduced access occurs with loss of health insurance benefits or health care benefits usually secured through employment. Stress related to unemployment may also act to depress health care utilization, even where health care availability is in principle undiminished as a result of national policy.

Psychological stress is generated in the unemployed, their dependents, and close associates through loss of social and economic position, anxieties over the future, damage to social networks, and the concurrent need to adapt to a new set of life circumstances. Psychological strains on persons employed in financially damaged firms result from threats of loss of social or economic status and from work stress. It is, therefore, of some importance that studies that compare the unemployed and employed from the same firm or community may occasionally find little difference between the two groups.

Psychological stress related to unemployment will result, theoretically, in the same types of mental health problems that are stimulated by other major sources of stress (*168*)—transient reactions and personality disorders, clinical depression, aggression, and psychotic episodes. Psychophysiological stress may also involve the cardiovascular, metabolic, reproductive, immune, or neurological systems.

b. Social Pathologies Associated with Economic Change

In the past 20 years, studies of the relationship of economic change to morbidity and mortality in industrialized countries have examined effects on mental and physical disorders. The earlier work, dealing with mental health problems, tended to emphasize the role that economic loss might play in causing stress. As attention to physical health problems increased, it became apparent that recession itself also played a principal role. At present, it is recognized that loss of resources and psychological stress are not easy to separate causally. The implication is that, in the vast majority of pathologies, including mental and physical health and criminal aggression, some combination of resource loss and psychological stress is probably involved.

HEALTH INDICES AND ECONOMIC CHANGE

1. Suicide

Suicide is the first indicator of mental pathology found to increase consistently with adverse changes in the economy (*123–124*). A number of researchers have replicated these findings, and they attest to the severe stress that is brought about by economic recession.

2. Mental Hospital Admissions

Since the 1930s, a number of researchers have attempted to demonstrate a relationship between adverse economic changes and increases in mental hospital admissions. Three recent studies of note have demonstrated that the relationship can be measured consistently over time (*125–127*). The first of these studies dealt with Massachusetts during the 1930s, the second with the whole United States during the Depression, and the third with New York State for the period 1841–1967. It was demonstrated that, during each of the recessions since 1841, the number of both first admissions and readmission to mental hospitals increased substantially. Cyclical changes in the economy were the single most important factor in trends of admission to mental hospitals. The New York State study was replicated for the entire United States and for each state for the period 1928–1969, with nearly identical results (*127–128*).

3. Alcohol Abuse

The findings on alcohol abuse are consistent with the hypothesis of increased mental disorder precipitated by social-psychological stress during economic recession. It was initially observed that increases in mortality rates due to cirrhosis of the liver were positively related, over time, to consumption of alcohol (*129*). It was subsequently estimated that there is a lag between the increase in per capita alcohol consumption and cirrhosis mortality rates (*129*). In addition, it was shown that consumption of distilled spirits (rather than wine or beer) was the significant factor in cirrhosis mortality, and that such consumption was related to cyclical declines in the national economy. Finally, it was observed that cirrhosis mortality itself increased substantially 1 to 2 years after national economic recessions (*129*). It was clear that, because it takes a long period of time to acquire chronic cirrhosis of the liver, the short-term economic trauma had not initiated the cirrhotic condition, but that, once morbidity was present, economic recession tended to hasten mortality.

Additional findings continued to reflect the importance of the relationship between the increased consumption of distilled spirits and the declining state of the national economy. Thus, admissions to mental hospitals in New York State and in the United States as a whole, of persons diagnosed as having psychosis related to alcoholism or with any alcohol-related mental disorder, showed substantial and stable increases during economic recessions for the period 1921–1968 (*127, 129*). Similarly, arrests for drunkenness in Massachusetts were found to increase with adverse changes in the national economy during 1915–1968, with the arrests lagging 2 years behind fluctuations in the economy (*129*). Finally, the arrest rates for driving while intoxicated in the United States as a whole, and the number of persons brought to trial and found guilty of driving while intoxicated in the city of Philadelphia, were found to increase substantially during national economic recessions (*129*).

4. Motor Vehicle Accidents

In keeping with the findings on the relationship of economic recession to arrests for driving while intoxicated are more general findings on the relationship of economic recession to deaths resulting from automobile accidents in the United States (*130*). These findings hold across all ages, both sexes, and whites and nonwhites, and may or may not be related to alcohol abuse. This relationship may be due in part to the effects of stress on intellectual functioning, which may, in turn, result in errors in driving or handling other machinery. It has also been suggested that automobile accidents represent a form of highly aggressive and violent behavior related to decreased impulse control under stressful conditions. The latter hypothesis is consistent with findings that homicide rates have been strongly influenced by economic recession, particularly for white males in the United States, and in Canada, England, Wales, and Scotland (*132–143*).

5. Heart Disease

Increasingly, empirical research has been devoted to factors in the incidence of, and mortality from, heart disease. The first studies clearly demonstrated that fluctuations in heart disease mortality rates for New York State were inversely related to the employment rate in New York State for 1915–1967. They also showed that mortality from diseases of coronary arteries was related to fluctuations in the unemployment rate for the United States as a whole during 1930–1960 (*133*). Both the relationships for New York State and the United States showed that the peak of increased mortality lagged at least 2 to 3 years behind economic recessions.

The work on heart disease was followed by extensive studies of the relationship between national economic indicators and cardiovascular-renal diseases in general (*134*). The hypothesis was that these illnesses include significant psychophysiological factors involving hypertension, as well as serum cholesterol levels. The total category of cardiovascular-renal diseases and major subcategories, including circulatory system diseases and chronic nephritis, was examined. Because cardiovascular-renal diseases account for approximately 60 percent of all mortality in many industrialized nations, the data were examined in 10-year age groups, by race and sex, for the United States during 1914–1968. A consistent relationship was found between national economic fluctuations, measured by per capita income or employment rates, and cardiovascular-renal disease mortality rates. For cardiovascular-renal diseases in general, the peak lag behind economic recessions ranged from 3 to 6 years, depending on age, and the peak lags for chronic nephritis ranged from 0 to 2 years. For cerebrovascular diseases, the lag ranged from as much as 6 to 9 years.

6. Infant Mortality

The infant mortality rate has long been regarded as one of the most sensitive indicators of the general socioeconomic level of the nation, and the relationship between the economy and infant, fetal, and maternal mortality has received extensive examination. In all industrialized countries for which data are available, the secular trend of industrial growth has been inversely related to the long-term trend in infant mortality rates (*135*). For industrialized societies, however, the problem of adapting to economic change is associated less with the level of economic growth than with whether that growth is relatively smooth or chaotic.

In investigating the relationship between economic instability and mortality in infants under 1 year of age, the following hypotheses were raised: (1) There is a short- to intermediate-range relationship of approximately 0 to 3 years between economic trends or fluctuations and trends in infant mortality rates. This relationship has historically been an important component of the relationship between low socioeconomic status and increased infant mortality. (2) This 0- to 3-year relationship has had more influence on infant mortality trends since 1950, perhaps as a result of the relative decline in the beneficial impact of secular economic growth in an economy that is already highly developed. To test the applicability of the hypotheses to the full age range of infant and fetal mortality, the following categories were examined: rates of infant mortality under 1 day, under 28 days, from 28 days through 1 year, and fetal mortality. All data were examined by race. All categories of fetal and infant mortality increased sharply in relation to economic recession with a peak lag of from 0 to 2 years (*135*).

CRIMINAL JUSTICE INDICES

The trend in unemployment appears to be the most intensively studied economic factor in relation to crime. Thus, property crime (*136*) and delinquency (*137, 138*), as indicated by reported crimes on the national level, are significantly related to unemployment. Admissions to prisons and the homicide rate also vary with unemployment, according to several studies. For the period 1926–1962, admissions to state prisons and the homicide rate for the entire United States and for New York State were positively correlated with the unemployment rate (*139*). In the state of Georgia, the prison population was similarly observed to change with fluctuations in the unemployment rate during 1967–1974 (*140*). The size of the federal prison population was shown to be related to the unemployment index of 15 months earlier for the period 1952–1974 (*141*).

Again, for the period 1960–1972, strong relationships were found between the unemployment rate and both federal and state imprisonment for the United States as a whole (*142*).

A cross-national comparison of California, Massachusetts, and New York, and Canada, England, Wales, and Scotland, over the years 1920–1940 and 1947–1973, also demonstrated positive relationships between the unemployment rate and every measure of criminal activity, for both personal and property crimes (*143*). Finally, several studies have indicated that unemployment directly influences parole, mandatory release violations, and recidivism (*144–146*).

UNEMPLOYMENT RATE AS INDICATOR

Although the health effects of high unemployment rates are not confined to the unemployed population, considerable research has focused on the particular risks to the unemployed. For example, a large national sample of middle-aged men in Britain shows that being unemployed is associated with chronic physical illness, including bronchitis, obstructive lung disease, and ischemic heart disease (*169*). One of the many published and unpublished reviews of the literature prepared in the last few years offers a particularly cogent assessment indicating that "there is good evidence that losing one's job can increase health risks, exacerbate chronic and latent disorders, alter the usual patterns of health-seeking behavior and exact numerous other social and interpersonal costs" (*170,* p. 1116). Another study concludes ". . . it is clear that unemployment in general is associated with individual psychological distress" (*171,* p. 11).

SUMMARY

The recent investigation of the relationships between economic recession and morbidity and mortality was preceded by a history of research covering the relationships, at single points in time, of low socioeconomic status to high rates of morbidity, mortality, and limited use of medical care. These relationships were consistently found in epidemiological studies and health care utilization studies, and for both physical and mental disorders. Attempts were recently made to measure the association between national economic recession and national health status.

The hypothesized relationship was in fact found between adverse economic changes and declining health status. Specifically, rates of suicide; cirrhosis mortality; homicide; motor vehicle accident mortality; infant, fetal, and maternal mortality; mental hospitalization; and indicators of alcohol abuse all increased as national economic conditions deteriorated, with lags of less than 2 years. Similar relationships between adverse economic conditions and health status were found for the cardiovascular-renal diseases, except that mortality from these diseases lagged for a period of from less than 2 years to 9 years.

The increase in morbidity in the population following economic recession may be seriously compounded by a decline in use of health services due to decreased purchasing power. This is an extremely serious potential problem for maternal and child health and for illnesses in which rapid diagnosis and treatment are essential. It should also be noted that the effects of economic recession on health status vary greatly for different groups within the population. For individuals of comparatively low socioeconomic status, including a significant proportion of the nonwhite population, the consequences may be particularly severe.

Finally, a number of studies since the 1960s have found strong relationships between crime indices and lack of employment. Rate of property crimes known to the police, admissions to state prisons on the state and national levels, and admissions to federal prisons have been correlated with changes in the unemployment rate. For rates of homicide and other personal crimes, significant positive relationships were found with changes in unemployment rates.

RESEARCH CONCERNS

In relating trends in economic indicators to health status in industrialized countries, one must distinguish between cyclical changes in the economies of non-socialist countries, where the production and consumption patterns are not planned, and the long-term effects of economic change. The long-term effects influence the overall population life span and prevalence of chronic, versus acute infectious, diseases. The cyclical effects, on the other hand, influence short- and medium-term departures from those long-term mortality and morbidity patterns.

Lags must also be identified in analyzing the effects of economic change on morbidity and mortality. In industrialized countries, a time generally passes between the change in the national economic indicator and the change of health status. For example, in the case of chronic disease morbidity, one might expect the severe manifestations of illness to occur after a lengthy series of disturbances.

An additional factor involves the issue of lags and the precise mechanisms whereby adverse changes in the economy may increase the population morbidity level. In the case of heart, cerebrovascular, and renal diseases, it is assumed that the primary source of deleterious influence of economic adversity will be through the mechanisms of social-psychological stress acting to elevate levels of hypertension and, perhaps, blood cholesterol levels. One would assume that the effects of stress on hypertension or serum cholesterol would be prolonged and extensive (possibly 2 to 7 years) to produce results of severe morbidity or mortality.

The limitations of available data, gaps in our theoretical knowledge, and problems inherent in the methods of correlation have restricted causal interpretation of the findings discussed above. Consequently, there has been no consensus among specialists as to the causal linkages in a number of the cases reviewed in this chapter. Nevertheless, the hypotheses on which the present report is based are consistent with the basic findings contained in the literature reviewed.

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IV. THE ECONOMIC CHANGE MODEL OF PATHOLOGY

Introduction

A general theoretical model, the Economic Change Model of Pathology, was designed to model statistically the impact of changes in the economy on physical and mental health and criminal aggression in the United States during the past 30 years. The model brings together a variety of economic conditions, organizes them in context, and shows the relationships among them. Both the major economic stresses of recession and the beneficial and deleterious factors related to economic growth and development are emphasized. Thus, it is a model which can be used in times of both economic growth and decline so that different periods can be compared statistically and, over time, can be better understood.

Scope of the Study

As outlined in detail in the previous chapter, both historical and recent evidence demonstrate that low socioeconomic status is associated with poor health (*1–7*). Furthermore, it is argued that economic loss and downward mobility typically associated with recession are related to increased morbidity and mortality, particularly for persons of low socioeconomic status.

The Economic Change Model of Pathology is designed to contribute to a more accurate picture of the complex relationship between the economic environment and individual well-being by taking into account the impact of changes in the economy on the social areas of physical and mental health and criminal aggression. Changes in measures of the aggregate economic status of the population are seen in relation to changes in the pathological indices. The process involves two steps. The first is to associate indicators of health and social pathology with each of the following model elements: economic growth, economic instability, economic inequality, adaptational errors associated with economic growth, and random shocks. The second is to generate and test hypotheses which emerge from the resulting relationships.

Indices of social pathology and mortality are measures of human happiness and well-being. Mortality rates are indications of the changing life span. Mental health indices—mental hospital admission rates, suicide rates, and cirrhosis mortality rates—cover a number of broad mental health problems which, taken together, generally reflect the overall mental health status of the population. Indices of criminal aggression—imprisonment, arrest, and major crimes—are measures of disturbance in the social environment.

A distinction between long-term trend and cyclical change is crucial to an understanding of this model. Long-term trend refers to the lengthy, relatively even process of growth which is healthy for the economy. Cyclical change is the semi-periodic fluctuation of many aspects of national economic activity (employment, investment, consumption patterns, etc.).

The cyclical movement is one of two aspects of economic instability. The other is the problem of obsolescence, which results from increased productivity. Actual increased productivity occurs through the process of invention and replacement: tractors replace horses, and automated equipment replaces factory workers. This process may push some portion of the population out of the production process. In this way, short-term cyclical changes frequently interact with long-term or structural economic changes.

In periods of economic growth, the long-term decline in average weekly hours worked in manufacturing and other industries is a reasonably good indicator of increased leisure time and favorable working conditions. In contrast, the short-term decline in average weekly hours worked is associated with recession and is an indicator of economic loss for individuals, business organizations, and the population as a whole.

Lag Structure

It is also necessary in the general model to specify the range, over time, during which the relationships are expected to take place. In general, we expect increases in mortality rates, mental pathology indices, and criminal justice indices to be seen within a 6-year period during and after recession. Based on previous research in the United States and other countries (Canada, United Kingdom, France, West Germany, Sweden, Finland, Italy, Spain, and Australia), we expect that there will characteristically be two peaks in the relationships within that 6-year lag period. The first of these peaks, occurring during the first year of the recession, usually reflects: (1) sharp psychological reactions to substantial economic loss such as is manifest in the suicide rate, in mortality affecting highly vulnerable populations, and in criminal justice indices; (2) decline in nutrition and medical care utilization, which affects infant mortality and mortality among the chronically ill.

The second peak typically occurs 2 to 3 years after recession, as measured at the highest level of the unemployment or business failure rates. Though chronic disease mortality (especially cardiovascular disease) is particularly involved, nearly all sources of ill health and social pathology are implicated. The 2- to 3-year peak reflects a period of continued economic loss for the population that is downwardly mobile as a result of recession. This sequence can be observed by examining standard chronologies of economic indicators.

Recessions usually occur over a period of less than 12 months which covers the time from the peak to the trough of economic activity. Specific "lagging" economic indicators, however, such as the unemployment rate, will usually not return to their pre-recession level for 2 to 3 years. Following severe recessions, 4 to 5 years may pass before employment-related indices return to pre-recession levels. During the entire period of recession and subsequent depressed employment, the downwardly mobile population experiences continuous erosion of economic and social status with attendant damage to social relationships.

It is noteworthy that much of the post-recession period of depressed employment occurs at a time when the majority of the population is experiencing sustained economic improvement. This post-recession period, then, represents the time of maximal psychological deprivation for those who are seriously damaged by recession. At this time, the downwardly mobile population loses both in absolute terms and in relative terms as compared to the majority of the population. The psychological trauma of the downwardly mobile at this time is exacerbated by their own, their families', and their associates' belief that their losses are probably permanent.

The zero- to 5-year interval of increased mortality associated with recession is understood to reflect, in part, increases in the incidence or severity of chronic illnesses which in some instances result in mortality. It is assumed, however, that the majority of those whose ill health is aggravated by recession probably do not die within a 6-year period of recession. Rather, the seriously ill population becomes more vulnerable to mortality during at least the subsequent decade. Their heightened vulnerability results from three mechanisms.

The first is simply an acceleration of the natural progression of chronic disease processes that have been stimulated or exacerbated by recession. A second arises from the fact that subsequent recessions will occur and inflict more serious health consequences on the population whose health has already been put at risk. Consequently, the extent of recession-related damage on a population's health is in part related to the degree of damage that was associated with previous recessions. A third source of heightened vulnerability reflects the increased probability of economic loss following increased severity of recession-related illness. A chronic mental or physical disorder that becomes incapacitating will in turn increase the difficulty of maintaining or regaining a job or income. This secondary condition of deterioration in the subject's socioeconomic position is then likely to increase the long-term risk of chronic disease or mortality.

To recapitulate, the general model specifies damage to mental, physical, and social well-being over a 16-year period. This period includes the initial 6-year period of recession and its aftermath. It also includes the damage to general physical health that may continue over at least the subsequent decade.

THE ECONOMIC CHANGE MODEL

Economic Growth

The first element of the Economic Change Model of Pathology, long-term economic growth, is taken to be the underpinning of social well-being and increases in the life span. Long-term economic growth is responsible for increased resources, or wealth per capita, by which society is better able to manage the natural and human environments. The relationship between growth and mortality derives from the basic definition that economic growth produces higher levels of resources within a population. Resources can be allocated to: (1) improvements in the standard of living; (2) investments in the development of new knowledge; and (3) investments in the applications of existing knowledge (*35,* Ch. 9), including medical care and education of the population. Economic growth is also the basis for improved working conditions, including health and safety measures, leisure and social insurance, and aid to the disabled, elderly and poor.

Over the long run, the net effects are the result of both beneficial and adverse factors made possible by growth. Beneficial factors include the potential of social investment in the development of new knowledge. The application of that knowledge may result in a higher standard of living: good nutrition; climate control through housing, clothing, and the use of fuel; parasite control; education; comfortable working conditions; and adequate monetary and social remuneration for work. A major beneficial factor in the case of morbidity and mortality is the provision and utilization of primary health services.

Because the beneficial factors resulting from economic growth are generally greater in number and importance than the adverse factors, over the long run, the net effect of economic growth is beneficial to health. Economic growth provides the material resources necessary for human adaptation to the environment. On occasion, however, technological innovations and social changes partly related to economic development result in adverse implications for health. These adverse results are usually due to lack of knowledge that the technological or social changes are actually causing harm to health.

Such lack of knowledge is generally related to the scientific problems of measuring: (1) delayed effects (especially where they are cumulative, or distributed through time); (2) threshold effects (effects that do not produce health damage except at a certain level, or threshold); and (3) interactive effects in which specified factors are damaging only, or especially, in combination. Under conditions of continued economic growth—particularly where these problems are of considerable societal concern—investments will be made into research that will ultimately provide an understanding of these problems and technologies to minimize their harmful effects.

A number of risk factors to physical and mental health, made possible by high mass consumption and technological development related to long-term economic growth, have become unusually prominent during the past two decades. Included are the immoderate consumption of alcoholic beverages, tobacco, and animal fats; increased reliance on non-human energy sources and the corresponding effects of a sedentary life, such as a decline in cardiovascular fitness and consumption of excess calories; and the improper use of medicine and psychotropic drugs.

Economic growth is also related to a decline in strength and stability of primary relationships, especially within the nuclear family and extended kinship networks, as indicated by high and increasing divorce rates; high proportions of the population living alone; the prevalence of female-headed households; and career-related disruptions to family formation and childbearing.

This general theoretical conception of the effects of economic growth on health and social well-being leads to the following specific hypothesis:

> The overall mortality rate for all ages of both sexes decreases in relation to long-term increases in real per capita income.

Long-term economic growth is defined, in this study, according to a measure of real per capita disposable income (i.e., accounting for the rate of inflation). The "pure" trend element of economic growth tends to have an exponential form. We therefore fit an exponential trend to the real per capita income and eliminate the cyclical component, which is measured by the variables discussed in the section on economic instability. The relationship between increase in economic growth and decrease in the overall and specific mortality rates is expected to hold under statistical controls for trends in detrimental factors historically associated with economic growth, such as cigarette smoking, heavy consumption of alcoholic beverages and animal fats, and measures of social isolation.

Economic Instability

Economic instability as used in this report largely represents the decline phase of the business cycle, indicated by a rising unemployment rate, high rates of business failures, and declines in labor force participation. As a result of economic instability, the population fails to gain benefits it would have gained if growth had continued at a previous rate. The loss, or failure to gain, in benefits is not evenly distributed. Persons with few or obsolete skills, workers in declining industries, older workers, and persons living in economically declining areas may be more adversely affected.

Under these conditions, certain groups in the population experience loss of, or serious damage to, their socioeconomic position. With persons who are downwardly mobile, the greatest psychological hardships occur when hope of re-establishing their former positions is lost. Among the mechanisms involved which lead to psychological harm are fear of loss of social identity; loss of basic economic resources; loss of primary social relationships; forced migration; and fear of their inability—and intense striving—to re-establish socioeconomic position.

It is also argued that recession will adversely affect those who work. A secondary set of mechanisms affects employees who remain at work. These include a lack of promotion and poor or competitive relations among staff; emphasis on high productivity; and work overload caused by critical shortages of employees and an atmosphere of anxiety and tension. Such conditions may generate for much of the population stresses nearly equivalent to those resulting from loss of employment.

We can derive the following general hypothesis from these theoretical conceptions on the effects of economic instability on societal pathology:

> Economic instability relates to a higher incidence of physical and mental ill health and criminal aggression.

From this general hypothesis, we can derive the following specific hypotheses:

> Increased unemployment rates are related to increases in total mortality rates.
>
> Increased unemployment rates are related to increases in cardiovascular mortality rates.
>
> Increased unemployment rates are related to increases in cirrhosis mortality rates.
>
> Increased unemployment rates are related to increases in suicide rates.
>
> Increased unemployment rates are related to increases in mental hospital admission rates.
>
> Increased unemployment rates are related to increases in imprisonment rates.
>
> Increased unemployment rates are related to increases in the rate of crimes (known to police by type).
>
> Increased unemployment rates are related to increases in the homicide rates.

The unemployment rate is the principal indicator of recession-related economic loss used in this model. At the macro, or population, level of analysis, an increase in the unemployment rate is an indicator of the extent of recession and/or structural economic decline. Economic distress reflects, for some part of the population, loss of work; loss of income; downward social mobility; increased stress; and possible increases in poverty levels. At this level of analysis, we can identify relationships between the aggregate unemployment rate—acting as an indicator of several sources of social distress—and measures of health and criminal aggression.

Other related hypotheses are as follows:

> The increased rate of business failure is related to increases in total mortality, cardiovascular mortality, and suicide rates.

The business failure rate is a prominent indicator of recession and is argued to be important for self-employed and small business owners in the age group over 45, and especially over 65. This indicator tends to reflect a period of chronic anxiety, during which business persons struggle to save their firms from financial destruction and protect themselves from major changes in social status and way of life. We therefore anticipate a lag of within approximately 2–3 years between an increased business failure rate and increased pathology rates.

> Decreases in labor force participation rates are related to increases in mortality rates, mental hospitalization admission rates, and criminal justice indices.

The unemployment rate and age- and sex-specific rates indicate many of the effects of recession-related losses and anxieties, but they actually measure only the extent to which members of the population are looking for work. Substantial proportions of those who look for work, however, do not find it, become discouraged, and leave the labor force entirely. This has been true especially of males over the age of 45 during the past two decades. Because most

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of these persons are unemployed for 1 or 2 years before they leave the labor force, we expect decreases in labor force participation to lead to increased pathology within 2 years.

> Increases in labor force participation of the 16- to 17-year-old male population are related to increases in the arrest rate of persons under 18, the crime rate, and the homicide rate.
>
> It is thought that increased labor force participation by 16- to 17-year-olds is a probable indication of alienation from secondary school as well as of decreased family income. The forms of pathology most likely to demonstrate alienation and poverty in the 16- to 17-year-old male population are property crimes and violent crimes.
>
> Short-term decreases in average weekly hours worked are related to increases in total and chronic disease mortality rates.
>
> Although not necessarily thought to result in profound psychological or criminal deviance, the stress that results from lost hours of work (and related lost income) during recession could trigger physiological reactions in susceptible individuals.

Economic Inequality

Economic inequality relates to the distribution of the product of economic development. For reasons which usually depend on structural changes in the economy, specific populations may not gain—or may actually experience losses in—economic status, while the majority of the population takes part in the process of economic growth. In the United States, youth, the elderly, women, and ethnic minorities frequently experience this situation.

Serious economic inequality has an even greater adverse impact, which is compounded during periods of economic growth, when the majority of society is earning at least moderate incomes and is not experiencing high unemployment. The most adverse effects are typically experienced by a significant proportion of youth of lower socioeconomic status, especially those with minority ethnic backgrounds. Many elderly persons who are chronically impoverished and a sizable proportion of female heads of households also experience the worst effects of economic inequality. Finally, the problems of long-term unemployment (as opposed to short-term cyclical unemployment) and low income have, in the last decade, been extended to former workers in the automobile, glass, steel and rubber, and other durable goods industries which have suffered long-term declines in employment.

In periods of economic instability, the economic loss and downward mobility typically associated with recession lead to expansion of socioeconomic status differentials; thus, the effects of recession become an even greater burden, proportionally, on the downwardly mobile. Economic inequality becomes even more acute when the general population is moving out of a recession. While some individuals gain, a portion of the population never recovers. This portion then experiences lower socioeconomic status and exhibits higher mortality rates.

The model allows for the impact of economic inequality on the two preceding relationships by developing hypotheses for specific populations.

> Increases in the unemployment ratio for all ages and both sexes are related to pathological indices.

The reason is that none of the age- or sex-specific unemployment rates corresponds exactly to the fluctuations of the overall unemployment rate. Using the ratio of age- and sex-specific unemployment rates to the total unemployment rate, we can more precisely identify the relationship of each group's unemployment rate to its own pathological pattern.

Just as the total unemployment rate does not measure precisely the unemployment situation of specific age and sex groups, neither does the total per capita (real) income precisely measure the real income gain or loss situation of each of the age and sex groups. The proposed solution is the same; namely, in addition to the total per capita income, the age and sex median income ratios are used.

Adaptational Error

Adaptational error associated with economic growth refers to the pathological results of specific patterns of consumption and production. Pathologies occur either because of ignorance, difficulty in changing habitual behavior, or potential damage to economic interests, which are linked to the consumption or production of specific items. Examples are immoderate alcohol consumption; abuse of prescription or illicit drugs; cigarette smoking; regular consumption of foods that are excessively high in fat content; environmental contamination with chemical toxins; greatly increased numbers of motor vehicles in the population; and failure to use protective devices, such as seat belts, crash helmets, and air bags, in road traffic. Another adaptational problem associated with economic growth pertains to disturbed social relations such as social isolation due to divorce or solitary living arrangements.

Two sets of hypotheses emerge: one that addresses those adaptational errors which result from increased mass consumption and a second that explains the social isolation that is associated with economic development.

The hypotheses involving risks resulting from high mass consumption are as follows:

> An increase in the heavy consumption of alcoholic beverage is related to high mortality rates, especially from cardiovascular illness and cirrhosis of the liver.

Although moderate levels of drinking may be protective with respect to some illnesses (especially ischemic heart disease), heavy consumption of alcoholic beverages is expected to show a positive relation to general mortality, especially from cardiovascular illnesses and cirrhosis of the liver, specified malignancies, abortions, accidents, infant mortality, and alcohol dependence syndrome possibly involving aggression or depression. In such cases, the lags are relatively short (0–5 years), as this population may already be chronically morbid or affected by intervening changes in cognitive ability, mood, motor ability, or other factors that could influence their mortality rates.

> An increase of cigarette consumption per capita is related to higher mortality rates, especially from cardiovascular and respiratory diseases.

The per capita consumption of cigarettes is expected to be positively related to mortality rates, especially from cardiovascular and respiratory disease. In this case, the lags may be short or long. Short lags of 6 months to 7 years occur in a population that is already seriously ill and for which additional smoking exacerbates serious disease. For other populations, the lag is generally 10 to 15 years.

> A high level of consumption of animal fat is associated with high mortality rates, especially from cardiovascular disease and malignancy.

A high level of consumption of animal fat is a risk factor in a great many causes of illness—especially in cardiovascular disease and malignancies. The consumption of animal fats per capita is expected to be related to total and ischemic heart disease mortality, with both short (less than 5 years) and long (15-20 years) lags. The short lag relationship is particularly pertinent to populations already afflicted with cardiovascular disease.

> Increases in automobile registration rates and miles driven per capita are related to higher mortality rates due to auto injuries.

Automobile registration rates and miles driven per capita are expected to be positively related to mortality from injuries—especially those involving youth—with a lag of less than 3 years.

Hypotheses involving risk factors related to a decline in primary relationships follow:

> A high rate of divorce is related to a higher risk of mortality and mental health problems.

This is one of two prime indicators of potential lack of social integration or social support. It is a standard finding in psychiatric epidemiology and recent studies of morbidity that the divorced population is at considerably greater risk of illness and mortality.

> A high proportion of persons living alone is related to a high risk of mortality and mental health problems.

The number of persons living alone and an increase in the proportion of female heads of households indicate a potential lack of social support. They are meant to reflect recent findings that social contact has a ~~negative~~ influence on morbidity. They uphold as well tenets of classic sociological literature on the alienating aspects of advanced urban living conditions.

> An increase in the proportion of female heads of households is related to an increase in the total mortality of persons under age 15.

The proportion of female heads of households is also related to poverty, as households headed by females are disproportionately represented in the number of poor households. Poverty places children at higher risk of morbidity and mortality.

Ameliorative effects of Aid to Families with Dependent Children are tested by the following hypothesis:

> Increases in the number of poor households receiving AFDC are related to decreases in the mortality of the young.

Random Shocks

An additional set of factors, "random shocks" to the population, needs to be taken into account in order to use this economic change model for detailed explanation or prediction. Random shocks include: (1) extremely disruptive phenomena, such as severe climatic irregularities; (2) epidemics; (3) events which damage the economy and the population in ways that go beyond usual economic predictions, such as natural disasters or political or international economic crises; and (4) important demographic changes such as were brought about by the "baby boom."

The following hypothesis, for example, is suggested by demographic developments:

> An increased proportion of males aged 15 to 24 in the population is associated with an increase in criminal activity.

This hypothesis was tested in the 1976 report and showed statistical significance. In the current study, however, the potential relationship between the ratio of young adult males in the population and the criminal justice indices did not show evidence of an active relationship. It is possible that a more appropriate variable may be the youth unemployment ratio. The large numbers of males aged 15 to 24 may have influenced the relatively high youth unemployment rate, which may in turn influence criminal aggression.

Involvement in war is a random shock adversely affecting the population's health and life span, particularly of those actually engaged in military actions. Size of the military population is correlated with the number of people on active duty for combat. One hypothesis is:

> As the rate of military personnel in the population goes up, indices of pathology and mortality rates increase, especially for the military-age population.

LIMITATIONS OF THE MODEL

In examining the specific cause of a relationship it is necessary to be aware of the possibility that an unobserved external factor is responsible for changes in both the predictor and predicted factors. In that case, the observed correlation between "explaining" and "explained" factors does not reflect a causal relation between them and instead results from their joint relation to a third factor.

In the present study, there is no external unspecified factor which is known to influence regularly both the state of the economy and, independently, mortality or morbidity rates. On occasion, unusual conditions such as war may influence economic conditions and health, but they do not do so on a continuous basis. There is no known external factor which regularly influences the state of the economy. Indeed, if such a factor were known, we would be able to use it in efforts to forecast economic conditions.

A different approach to the problem of the unknown external factor is to ask whether phenomena that are, for example, influenced by economic conditions also influence health. In this study, we ask that question with respect to several factors known to affect health adversely—alcohol, cigarette, and fat consumption per capita, social isolation, etc. The problem then is whether, if one controls for the effects of such additional factors, the relationships between economic conditions and health and social well-being still can be observed. In this study, such external factors are explicit in the model to be tested, under the general classification "adaptational errors associated with economic growth." In fact, we find that controlling for the adaptational error factors usually strengthens rather than weakens the relationship between economic conditions and the population's health and well-being.

We conclude, therefore, that the hypotheses do not appear to be influenced by issues of random occurrence or lack of control for factors which should have been taken into account. As in all studies based on statistical procedures, however, the findings can only be taken as evidence in favor of, or against, the specific hypotheses tested.

In this case, for example, considerable statistical support is found for the statement that economic instability is related to adverse change in national health and well-being. But it cannot be said that our findings prove the existence of causal relationships. Statistical studies only permit statements of probability, not absolute proof.

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V. RESULTS

SUMMARY

For each of the five elements of the Economic Change Model of Pathology, the current study finds the following:

Economic Growth

Long-term increases in real per capita income show statistically significant relationships, almost without exception, to decreases in the social pathologies investigated in this report. Although the strength of the relationships varies by pathology and age group, economic growth is associated with decreases in total mortality, cardiovascular mortality, suicide, and psychiatric hospital and prison admissions.

Economic Instability

Measures of economic instability show statistically significant relationships to increased mortality of all ages, and for all classifications of sex and race. Similar relationships are found with measures of mental ill health and criminal activity. The principal measures of economic instability are unemployment, business failure rate, labor force participation, and average weekly hours of work.

Economic Inequality

Measures of economic inequality, principally age-specific unemployment ratios, are associated with increases in the most deviant pathological behavior investigated in the report: criminal aggression and pathological uses of alcohol.

Adaptational Error

The measures of adaptational error associated with economic growth investigated in this report are unequivocally related to pathological indices. Increased alcohol consumption relates to either increases or decreases in the indices depending on the type of beverage. Increases in all other adaptational errors are associated with increases in all the health and social pathologies.

These results are explained in detail in the following pages.

INTERPRETATION OF RELATIONSHIPS

The hypotheses of the study indicate that trends and fluctuations in national health levels are influenced by national economic changes and are similarly influenced by national patterns of consumption, production, and social isolation.

The relationships between national economic changes and national health levels are based on simple and compound factors.

Simple factors are those that are measured by one variable, such as alcohol consumption or animal fat consumption, and that can be interpreted directly at the individual level. For example, the meaning of per capita cigarette consumption as a health risk for heart disease is identical for both the individual and the population.

In contrast, compound factors, such as economic instability, are multidimensional and can be measured by several variables which have different implications for different individuals. For example, under conditions of economic instability or recession, unemployment, substantial loss of income, departure from the labor force, increased work stress, home mortgage foreclosure, and forced migration will increase. But an individual usually will not experience all, or even most, of them.

To capture the harmful effect of recession as a health risk factor, we are able to use only a few variables to document economic loss. The measures of economic instability—rates of unemployment, labor force participation, and business failures—in fact represent more than they directly measure. Indirectly, as a group, they measure a portion of the general population's recession-related experience. The experience of individuals, however, may include economic loss, the fear of further loss, and the attempt to regain socioeconomic position.

Correlation and Causality

Another point to bear in mind in interpreting these findings is that the present study can only be used as evidence in favor of, or against, the hypotheses put forward. The findings cannot provide proof of causal relationships. It is commonly held that causal statements have three minimum requirements: first, that the causal variable precede the affected variable in time; second, that there in fact is a relationship between the variables (that is, the observed relationship is not due to chance); and third, that some other variable does not cause both events in the model. The violation of any of these criteria would prohibit the finding of causal relationship.

This study attempted to account for each of these factors. Complete control, however, was impossible, and claims of direct cause and effect are therefore not made. For example, even though an elaborate time lag structure is specified, some relationships are found with a zero time lag; that is, the relationship is measured as occurring within 1 year. In these cases it is not known if the time precedence requirement is met. Also, even though the relationships are statistically significant, there is a small risk that they are due to chance, which would violate the second requirement of causality. Finally, although there are no known events that influence both national economic change and national health, research in the field is not sufficiently advanced to preclude the possibility. This is especially true at the individual level, where the complexity of the relationships between individual's economic condition, stress, and mental and physical health are not fully understood.

When a finding is observed to be statistically significant, we then wish to know whether it is consistent with: (1) other findings in the same study, (2) findings of related studies, and (3) theoretical considerations. Statistical significance, internal consistency, and consistency with the literature provide the evidence of the reliability and validity of the findings.

The Implications of Linearity and Nonlinearity

The findings reported in the present study assume, from a statistical standpoint, that the relationships between variables are linear. This means that the model assumes that the change in social pathologies is the same for all incremental changes in the measures of economic change. This assumption of linearity is for the ease of measurement only; in fact we have several reasons to believe that at least some of the relationships probably are not precisely linear.

It is possible that, for example, an increase in the unemployment rate from 10 to 11 percent would cause greater social damage than an increase from 2 to 3 percent. One assumption of linearity, however, is consistent with the notion that it is typical for the least educated and least skilled workers to show the highest unemployment rates at the point at which recession is judged to be most severe.

On the other hand, the unemployed of lowest socioeconomic status may feel some alleviation of the sense of self-blame and social blame at being without work or income during the worst part of the recession. Then, as recovery begins and unemployment rates fall slightly, there is likely to be a period in which the unemployed of low socioeconomic status are the principal population group that is unable to secure re-employment. Under such conditions, the psychological impact of recession on low socioeconomic groups may be most severe. These possibilities, while in principle quite plausible, have yet to be investigated in thorough statistical detail.

Equally important possibilities of non-linear relations exist in the case of the non-economic factors influencing health and social well-being. Consumption of alcohol, tobacco, and animal fats and production of toxic chemicals are prominent examples. There may be low thresholds, per capita, at which these substances are not harmful to the population's health. There may be thresholds above which they are extraordinarily injurious and may actually increase the risk to health exponentially. It is also possible that some of these substances may be more damaging when taken in combination with one another.

At present, our knowledge of such non-linear possibilities is inadequate. For convenience of measurement, we maintain only the simplest assumption, that of linearity. The caveat must be stated, nevertheless, that the structural features of our current model may be less than precise in some instances.

COMPARISON WITH THE 1976 FINDINGS

The basic finding of the 1976 report that long-term economic growth has a beneficial impact is reaffirmed. Also reaffirmed in the current report is the extraordinary importance of recession and its relationship to societal pathology, which can be seen in virtually all the indices of mental and physical illness and criminal justice activity. The present study reiterates the importance of the unemployment rate as the most reliable measure of recession-related injury. The present study shows new evidence that business failure rates and declines in labor force participation play a substantial role. The basic relationships between recession and the pathological measures are shown in this study, as in the previous one, to take place within a 6-year period. In the present study, however, we are also able to measure for the first time the pathological implications of recession which may occur for at least another decade beyond the initial 6-year period of lag.

The relationships between the adverse effects of recession and social well-being have changed as a result of specific measures of economic inequality which were not examined in 1976. In the 1976 report covering the years 1940–73, the primary measure of recession, the unemployment rate, was shown to be the major short-term factor related to homicide, mental hospitalization, and cirrhosis mortality. In the present study covering 1950–80, the economic inequality measures are at least of equal importance to the measures of recession for these pathological indices.

The importance of economic inequality is evident in each of the three pathological measures. With respect to homicide, it is the youth unemployment ratio that shows the dominant statistical relation, which may reflect the fact that homicide has increasingly become associated with young males. With respect to youth unemployment, the most serious problem has become one of economic structure rather than recession. In the case of state and county mental hospitalization, the last two decades have shown greater proportional admissions of the poor. The insured and middle-class populations have acquired greater access to psychiatric care in general hospitals, outpatient departments, and community mental health centers. It is therefore likely to be the populations whose mental illnesses are serious and chronic and whose unemployment situations are semi-permanent, rather than strictly recession-related, that make up the great part of public mental hospital admissions.

In the case of liver cirrhosis, increases in the ratio of age-specific income to overall population income have become more important in the short-term relationships to economic change, in comparison with the effects of overall national economic growth. Thus, alcohol may have come into greater use in cases of economic stress that are not confined to the poorest populations, but it is increasingly implicated in stress situations experienced by groups subject to relative economic disadvantage.

NEW FINDINGS

The most important statistically significant relationships for each element of the Economic Change Model of Pathology are described below. As with all reported relationships, these findings are presented without claim of demonstrated cause and effect.

1. Economic Growth

The overall mortality rate for all ages, both sexes, and the two major racial groups decreases in relation to long-term increases in real per capita income. The relationship is also especially prominent in the major categories of cardiovascular mortality and suicide. These conclusions conform to our general theoretical assumption that economic growth is the central feature of long-term improvement in the life span at all ages.

REAL PER CAPITA INCOME

The long-term exponential trend in real per capita disposable income is the most important indicator of long-term economic growth. As per capita income increases—at all ages, and for both sexes and major racial groups (Table I)—mortality rates decrease. The same is true for cardiovascular disease mortality, at all ages and for both sexes, as well as for the two major disease subclassifications of ischemic heart and cerebrovascular disease (Table I). With increased income, suicide by males—which usually is considerably more related to economic changes than suicide by females—decreases; this relationship is seen at all ages over 45. Admissions to psychiatric hospitals and prisons also decrease in relation to a growth trend in real per capita income.

At the same time, annual decreases in real per capita income are related, after a 1-year lag, to a higher arrest rate for all crimes in the age groups 18–24, 25–34, and over 55. This important relationship was specifically checked in relation to serious crime known to the police, with separate analyses for burglary, larceny, auto theft, robbery, assault, and rape. Only rape did not show a decrease with an increase in per capita income. For the other crimes, the relationship occurred only within 1 year. Finally, an increase in the arrest rate for crimes involving drug possession and sales were also related to decreases in annual per capita income within 1 year (Table III).

2. Economic Instability

Measures of economic instability are related to increased mortality at all ages, and for all classifications of sex and race. When economic instability is measured by the unemployment rate, associated increases in total mortality are usually seen over a 15-year interval, with the bulk of the increases occurring within 6 years (with particularly pronounced effects in the first 2 to 3 years). Other measures of economic instability—increased business failure rates and decreased labor force participation rates—are related to overall mortality increases with lags of 2 years and less. Measures of economic instability are related to indices of disturbed mental health and illegal activity within 6 years, and are especially prominent within 3 years.

These findings confirm our theory that the economic losses of recession, and other departures from smooth economic growth, are associated with increased mortality, mental ill health, and criminal activity.

UNEMPLOYMENT RATE

The total unemployment rate shows the most consistent relationship to the pathological indices. For each one of the pathologies, a statistically significant relation to the unemployment rate is found.

For total mortality at all ages (including infancy, 5-year age groups from 1–4 through 65–74, and 75 and over), for both sexes, and for nonwhites, the basic relationship is evident (Tables I and II). In general, the lag between the unemployment rate and mortality rates conforms to the specifications of the lag structure of the general model (see *Lag Structure,* pp. 39–40). For total mortality and mortality resulting from chronic diseases, two principal lags were specified: (1) a lag within the first 0–5 years after an increase in the unemployment rate, which comes to a peak at 2–3 years, and (2) a distributed lag over the following 6 to 15 years, which comes to an early or late peak depending on the cause of death. Two lags are seen in the relationship of mortality to unemployment, one of 2–3 years and another distributed over a range of 7–15 years, with a peak at approximately 10 years. These relationships prevail whether total or age-specific unemployment rates are used in the 2- to 3-year lag relation and whether the data are analyzed from 1950 to 1978 or to 1980.

The cardiovascular mortality rate shows a similarly powerful relationship to the unemployment rate, typically with lags of 3 years (the peak year of short-term lag) and 10 years (the peak of the 7- to 15-year lag span) for all 10-year age groups from 25 to 34 to 75 and over and for each sex. For both sexes, an additional lag of 5 years is seen in age groups from 25 to 54 (Table I). These relationships with the unemployment rate for total cardiovascular mortality also follow the basic pattern of lags found for total mortality as specified by the general model. These findings for total cardiovascular mortality are further substantiated by findings of similar relationships for diagnostic subclassifications—ischemic heart disease (with a peak lag of 3 years) and cerebrovascular disease (with peak lags of 3 and 10 years) (Table I).

The case of cerebrovascular (or stroke) mortality is an excellent example of confirming evidence for the general model as applied to chronic disease. Cerebrovascular mortality shows its first major relationship to unemployment (within a 0- to 5-year period) with a peak lag of 3 years; the peak period of stress following unemployment usually occurs with a lag of 2–3 years (see *Lag Structure,* pp. 39–40). The relationship between cerebrovascular mortality and the unemployment rate reaches a second peak after 10 years. The first lag however, occurs within 0–5 years and identifies both: (1) increased fatalities among persons who had cerebrovascular disease, and (2) increased incidence of cardiovascular disease that has not resulted in mortality within 5 years. The second lag, which occurs within 6–15 years, conforms to the assumption that a portion of the increased incidence of cardiovascular disease which occurs within 5 years of recession results in increased cerebrovascular mortality within the next decade.

For cirrhosis mortality, the unemployment relations are seen at peak lags of 3–9 years, depending on age and sex (Table II). For suicide, the relationships of unemployment rates to mortality usually occur with a 0- or 1-year lag for males at ages 15–74.

Total admissions to all mental hospitals are related to the unemployment rate with a lag of 1 year. Admission of resident patients to state hospitals, by specified age groups, is related to unemployment with lags which correspond to the findings for overall mortality and for suicide. The most prominent peak lags are approximately 3–4 years, but lags are also found within 1 year, as in the case of suicide, and at approximately 6 years, as in the case of cardiovascular disease mortality (Tables I, II, III).

Homicide shows a relationship to the unemployment rate only for selected age and sex groups—for example, females over 45 and elderly persons. Such patterns suggest family violence, including child abuse (both sexes aged 1–14), is implicated or robbery is involved. Other crime indices behave much as mortality does with respect to their relationships with the unemployment rate. Crimes known to the police, including burglary, larceny, automobile theft (grand theft), robbery, assault, and rape, are related to the unemployment rate with a peak lag of 3 years. The same is true for arrest rates at virtually all ages and for the white collar crimes of fraud and embezzlement.

There is also a prominent relationship between unemployment and arrest rates, including those for white collar crime, with a 0 lag (especially ages 18–34). The relationship is similar for robberies reported to the police (with a 3-year lag) and to homicide. For imprisonment, the basic relationship to unemployment is also seen with a 0 lag (Table III). It is possible that the absence of a relationship between unemployment and imprisonment after the first year is due to: (1) lack of data classifying imprisonment by crime or age, or (2) disturbances, within the criminal justice system, in the relationship between arrests and imprisonment, which we were unable to measure.

BUSINESS FAILURE RATE

The rate of business bankruptcy is the economic indicator with the second most prominent relationship to mortality rates. It was expected that this supplementary indicator of recession, and especially of psychological stress, would be particularly important for males, and some females, at the peak of their careers. Even during severe recessions, unemployment is least likely to affect men (particularly) in the 45–64 age groups, because they are likely to have job seniority. Thus, only if firms terminate their operations is it likely that, from the standpoint of the population aggregate, large numbers of senior staff will undergo major financial loss or destruction of career.

Another group we expected to show substantial harm as a result of business failure was the elderly whose incomes depend on investments or who are owners, operators, or employees of small businesses. (Small businesses have a particularly high failure rate during recession.) Many of the elderly are retirees but continue to remain economically active, either for the income or for the fulfillment that work can provide.

The independent relationship of business failures to total mortality is difficult to measure because it frequently occurs with a peak lag of 2 years, in which case the unemployment rate is an equally significant factor. Nevertheless, it shows a significant relationship, with a zero lag, to male mortality rates at ages 50–64 and to mortality for both sexes combined at age 75 and over. The findings for business failures indicate a very strong relationship for a segment of the late middle-aged male and elderly populations, and are quite close to theoretical expectations. This relationship of business failures to total mortality became increasingly powerful the closer the year under study was to 1980, the latest year for which mortality data are available.

It is with cardiovascular mortality that the relationship is especially observable, probably because one of its two peak lags (2 years) does not conflict with that of the unemployment relationship, which, for cardiovascular disease, has a lag of at least at 3 years. For cardiovascular mortality, the first peak in the relationship with the business failure rate occurs with no lag for all male groups ages 45–54 and over. In the case of suicide, the relationship to business failures is significant in several age groups, and especially for males, and thus influences the overall rate as well (Table II).

In light of the hypotheses that recession has a long-term impact on mortality rates as discussed above (see *Lag Structure,* pp. 39–40), business failure rates were examined for the presence of relationships to total mortality with lags distributed within 6–15 years. At all age groups over 45 years, the hypothesized distributed lag relations were found. Moreover, the long lags in business failure relationships are not simply substitute measures for identical long lags in the case of the unemployment relationship to mortality, which are found distributed over 7–15 years. Rather, the two principal indices of recession—unemployment and business failures—show independent long-term relationships to mortality.

LABOR FORCE PARTICIPATION

In addition to the unemployment rate, as age-specific labor force participation rates decline, total mortality rates frequently increase, with no lag. In such cases, the relationship is with mortality at ages 55–64, 65–74, and 75 and over, as well as for infant mortality associated with male labor force participation at ages 20–24. The latter relationship, similar to that found for infant mortality in connection with unemployment, is an indication of decline in family socioeconomic status, with related declines in nutrition, medical care, and psychological stability. Substantial relationships between the rate of suicides for females and the age-specific female labor force participation rate are seen with lags of 0–3 years for ages 35–44 through 65–74.

In contrast to labor force participation for all other age groups, the participation rate for the 16- to 17-year-old population was expected to show a positive relation to the pathology indices. It was expected that the substantial involvement of 16- to 17-year-olds in the work force tended to indicate a comparative lack of involvement in or alienation from high school scholastic activity and greater concern over economic competition with adults, against whom 16- to 17-year-olds have a comparative disadvantage. We observe, indeed, that 16- to 17-year-old labor force participation is positively associated with the arrest rate of persons under 18 (with a 1-year lag), with male and female homicide rates with zero lag, and with total mortality rates for both sexes aged 15–19.

AVERAGE WEEKLY HOURS WORKED, MANUFACTURING INDUSTRIES

By comparison to unemployment and business failures, hours worked is a somewhat less important indicator of the relationship between health indices and recession in the United States. This business cycle indicator tends to show stable inverse relationships to total mortality rates among groups aged 35–44 and 55–64, with a 0 lag. Like business failures, it shows some relationship between increased mortality and recession with no lag, though the principal relationships occur with longer lags.

3. Economic Inequality

There are, of course, important elements of economic inequality in the measures representing economic instability, because some groups lose in periods of recession and economic disturbance, while most of the population does not. This situation has the effect of increasing the extent of inequality. The psychological sense of inequality is further aggravated for the downwardly mobile during the subsequent period of sustained economic expansion.

In the present study, however, we add specific measures of economic inequality identifying, for example, the differential rate of unemployment in specific age groups compared to that of the general population. Using such a specific measure of economic inequality, we find that it shows a particularly strong relationship to increased mental ill health, criminal aggression indices, and pathological uses of alcohol. These findings conform to theoretical expectations in that they represent the most deviant pathological behavior, as usually judged by society, and frequently reflect a deeply alienated state of mind. The condition of being unemployed at a time when the population generally is not experiencing recession is similarly likely to reflect a state of alienation.

AGE-SPECIFIC UNEMPLOYMENT AND INCOME RATIOS

The unemployment ratio (the unemployment rate of a particular worker group divided by the total unemployment rate) for males aged 15–24 is the most prominent of the unemployment ratios in terms of relationship to the pathological indices. The outstanding relationship is to the homicide rate. At nearly all ages for male homicide, the 15–24 male unemployment ratio shows a peak relationship with no lag; for female homicide, the typical peak relationship occurs with a 3-year lag. This may indicate that homicide of women involves individuals whose alienation had developed over an extended period (over at least 3 years). The 15–24 male unemployment ratio is also related to the state imprisonment rate, with no lag (Table III).

Age-specific unemployment ratios are especially prominent with respect to rates of mental hospital utilization, at all ages from under 25 to over 65, with a 1-year lag. The unemployment ratio over 65 is particularly significant in its association with the total psychiatric hospital admission rate.

The male non-white unemployment ratio is significantly related to the state prison admissions rate, with a peak lag of 2 years; it is also related to the mental hospital population size for ages 45–64 and over 65, with a zero lag.

The age-specific income ratio was found to be significantly related to the cirrhosis mortality rate, with a peak lag of 1 year for males aged 25–64 and over 75 and for females aged 35–74.

4. Adaptational Error Associated With Economic Growth

The relationships of these factors to our measures of pathology also conform to the expectations of the general model. Except for alcohol consumption, which shows both positive and negative relationships, depending on the specific beverage and pathology, all of these factors unequivocally relate to increases in pathological indices.

ALCOHOL CONSUMPTION PER CAPITA

Alcohol consumption, which serves as a control variable in this study, typically shows an important relationship to virtually all the pathologies under study, with lags of 5 years of less. Total consumption, which emphasizes beer, tends to be statistically influential in pathologies that involve young adult populations including: mental hospital patient populations, arrest rates, crimes known to the police, narcotic arrest rates, suicide of males in several age groups, and suicide of females aged 15–24. It is very strongly associated with homicide of males and females over almost the entire age span and appears to account statistically, along with narcotics arrests, for much of the long-term pattern of homicide.

Spirits consumption per capita is important in total mortality patterns for virtually all ages and both sexes, with a zero lag. In the case of cardiovascular disease mortality, spirits consumption shows relationships for males aged 25–44 and for females aged 35–64 and over 75. It is also significant and positive for ischemic heart and cerebrovascular diseases (Table I). In the case of cirrhosis mortality, spirits consumption shows a stable relationship, with lags of less than 3 years, for nearly all ages and both sexes. Attempts to measure longer lags in the spirits-cirrhosis relationship were unsuccessful. In fact, it is thought that this relationship is probably cumulative, i.e., that marginal short-term increases in alcohol consumption can be fatal for individuals who already have serious liver damage due to heavy drinking for 10–20 years.

In the suicide relationship, spirits consumption shows a 0 lag for males aged 35–54 and females 25–54. Spirits consumption is significantly related to mental hospital admissions, with a peak lag of 3 years, which is possibly reflected in the similar 3-year lag in the relationship between spirits consumption and mental hospital population size at over 45 years of age. Spirits consumption per capita is also positively related to hospitalization, with a 0 lag, for the population under age 25. Spirits consumption is also associated with arrests, with 3-year or shorter lags, for the population over 35 years.

Wine consumption per capita is inversely related to cardiovascular mortality of males of ages 25–44, and positively related to that of both sexes over the age of 75. The predominantly inverse relationship to cardiovascular disease is probably accounted for by ischemic heart disease, in which the relationship with wine consumption is also inverse (Table I). On the other hand, wine consumption is strongly and positively related to cirrhosis mortality, usually with a peak lag of 3 years, for male age groups 35–74 and for female groups 25–64 and over 75. Wine consumption is also positively related to the suicide rate of women at ages 35–44 and 55–74.

Beer consumption per capita is positively related to total infant mortality (no lag), probably reflecting immoderate use of alcohol during pregnancy, and for persons aged 15–34 (with a lag of 2 years for the combined sexes). At the same time, beer consumption is inversely related to cardiovascular mortality for males at nearly all ages. This probably reflects the strong relationship between an increase in beer consumption per capita and a decrease in ischemic heart disease mortality, with a peak lag of 5 years. This inverse relationship between beer consumption (and, to some extent, wine consumption) and ischemic heart disease probably reflects the medically well-known observation that moderate alcohol consumption is, statistically, a beneficial factor in this illness. Finally, the ratio of beer (which reflects the weakest form of alcohol as measured by ethanol content) to total alcohol consumption is consistently inversely related to cirrhosis mortality at 0 lag for nearly all ages.

CIGARETTE CONSUMPTION PER CAPITA

Like alcohol consumption, consumption of cigarettes per capita has a pervasive relationship to mortality rates, but, unlike alcohol, the relationship is always positive. At all age groups for males, and for nearly all female age groups, the relationship between cigarette consumption and mortality occurs with lags of 4–8 years, with the last lag coming to a peak at the 5-year mark. It is possible that the lags may be indirect among age groups which do not smoke—nonsmokers may reside or work in an environment pervaded by smoke, and/or such an environment may present other risks associated with respiratory illness. Alternatively, the lag between smoking and mortality may have an effect which increases mortality or morbidity in parents or relatives of those whose risk of mortality has increased; in that case, the direct influence of cigarette consumption might be brought about by social isolation or decline in economic status due to illness or death. The importance of cigarette consumption to cardiovascular mortality is also seen in the significant relationships between cigarette consumption and ischemic heart disease and cerebrovascular disease mortality, with 10- and 7-year peak lags, respectively (Table I).

ANIMAL FAT CONSUMPTION PER CAPITA

The significant relationship between animal fat consumption per capita and ischemic heart disease mortality is found with a peak lag of 1 year (Table I).

CHEMICAL PRODUCTION

Based on clinical studies, synthetic organic chemicals are known to pose significant risk of liver disease. It is thought that liver damage may be greater in individuals who use alcohol heavily and who are exposed to toxic industrial or pharmaceutical chemicals. This has led to the hypothesis that chemical production may be positively associated with cirrhosis mortality rates. The relationships were found, with a 1-year lag, for males at ages 35–74, and for females at ages 45–64. The wider age span in the relationship for males is consistent with the hypothesis that males experience greater occupational-related exposure to chemical toxins.

AUTOMOBILE OWNERSHIP

Automobile ownership per capita, which is greater in periods of long-term economic growth, is a control variable expressing the potential for mortality due to automobile use. It shows a stable positive relationship to mortality for both sexes in the age range 10–44.

NARCOTICS ARREST RATE

The recreational use of street drugs is another adverse effect of long-term economic growth. The narcotics arrest rate, of course, has importance in periods which are economically unstable as well. The rate of narcotics arrests is frequently used in this study to indicate the shape, over time, of illegal use of narcotics by the general population. This narcotics use indicator is significantly related to the homicide rate at nearly all ages, with lags ranging from 0 to 3 years, but the peak lag is 1 year. The narcotics arrest rate also shows strong associations with mental hospital admissions with a peak lag of 1 year, admission of mental hospital resident patients under age 25 with lags of zero and 1 year, and total state prison admissions with a lag of 1 year (Table III).

DIVORCE RATE

The divorce rate is found to have a positive relationship with virtually all of the pathological indices under study. In nearly all age groups, there is a stable statistical link with no lag. This relationship affects fewer age groups in cardiovascular and cirrhosis mortality, except that it is nearly always present in the case of male cirrhosis with a 1-year lag. The relationship is found in the case of suicide for both sexes in young and middle-aged groups (where divorce is most frequent), with a typical peak lag of 2 years.

The divorce rate is, unexpectedly, related to male homicide for all but two age groups, with peak lags of 0–3 years, while only one female age group (45–54 with a 1-year lag) shows the relation. Arrest rates are related to divorce rates for age groups under 18 and 45–54, with no lag. The divorce rate is also seen as a statistical contributor to mental hospital admissions, with a zero lag, and to admission of mental hospital resident patients, with peak lags of 1 and 3 years, for age groups 25–44 and over 65, respectively.

LIVING ALONE, PROPORTION OF POPULATION

The proportion of the population living alone, like the divorce rate, is an important indication of social isolation and is positively related to the pathological indices. In the case of total mortality, the relationship, when found, is seen with no lag. The shortness of the lag strongly suggests that it is family and other social disintegration, occurring well before the decision to live alone or divorce, that is primarily responsible for the timing of these statistical relationships. The relationship applies to nearly all age groups among males, while for females, after occurring at infancy, it does not reappear until the mid-20s. For females, it is especially consistent after age 55. Similarly, the relationship between living alone and cardiovascular mortality can be seen for nearly all ages, for both sexes, with lags of 0–1 year. For suicide, the relationship is statistically significant in five of the male and female age groups, with lags ranging from 0 to 3 years. The relationship between living alone and homicide is not as definite as for suicide, only affecting three male age groups and two female groups, with lags of 0–3 years. The arrest rate, on the other hand, shows a relationship for ages 18–44 and over 55, with lags of 0 and 1 year.

FEMALE HEADS OF HOUSEHOLDS

The proportion of female heads of households is significantly related to total mortality rates in males and females at ages 1–14. This indicator of low-income status had a consistent relationship to mortality with a 1-year lag.

AID TO FAMILIES WITH DEPENDENT CHILDREN (AFDC)

The importance of the inverse relation of AFDC to total mortality is demonstrated in the cases of infant mortality for both sexes, with a zero lag, as well as female mortality at ages 1–4 and 5–9, with peak lags of 2 and 3 years, respectively. As more money is available for nutrition and health care during childhood, including the first year of life, mortality declines. AFDC provides benefits for enhanced nutrition and medical care, but it also indicates the absence of an adult male who would ordinarily provide some security from physical harm to a mother and her children. The result is a relationship between AFDC and homicide of males aged 1–4 and 5–14 and of females aged 1–4, 5–14 and 14–24. AFDC is also related to state prison admissions, with no lag, and suicide by males aged 15–24.

5. Random Shocks

MILITARY PERSONNEL

Military personnel on active service was used as a control in the analysis of total mortality for males at ages 15–24 and 25–34. The positive relationship was found with lags of 0 and 1 year, respectively. Military service, like other major life changes, was hypothesized to have disorganizing effects, for some individuals, on career patterns, family formation, and family stability. Related health risks of military service could include accidents, violence, and immoderate use of alcohol or drugs.

PROPORTION OF THE POPULATION IN THE 15-24 AGE GROUP

In the United States since 1950, crime has been predominantly committed by males aged 15-24. It has been thought by specialists that the size of the younger population, in comparison to that of the overall population, is a factor in crime trends. This is argued on the grounds that: (1) a higher youth-to-overall population ratio is responsible for higher youth unemployment rates and (2) a more youthful population is at greater risk of committing crime. Elaborating on the first point, a higher youth unemployment rate would be an important factor in the overall unemployment rate and would be especially important in the youth-population unemployment ratio.

The 1976 report stated that both the overall unemployment rate and the unemployment ratio of youth aged 15-24 were significant influences on homicide and imprisonment. In the present study, in which total unemployment and the 15-24 unemployment ratio are included, and where alcohol consumption, narcotics arrests, divorce rates, and the proportion of the population living alone are controlled, we are unable to find an independent significant relation for the 15-24 population ratio for the various crime indices. Therefore, to the extent that the 15-24 population is indirectly a factor in the crime indices, it probably acts through its effects on unemployment rates or age-specific unemployment ratios, or perhaps on the extent of alcohol or drug use, divorce, or the proportion of the population living alone.

6. The Issue of "Beneficial" Effects of Recession

As in previous analyses, this study again shows a relationship of recessionary indices, such as unemployment and business failures, to increased pathology generally with a 2-3 year lag. Because of this pattern, it could be asked whether, with no lag, the relation of unemployment to mortality may be inverse. This question reflects the possibility that a decrease in labor activity may lead to lower mortality within one year, as occupational risks associated with being at work are removed.

This question can be answered in two ways. First, the only significant occasions on which unemployment rates are inversely related to mortality rates involve simple bivariate relations—i.e., without controls for the relevant epidemiological risk factors. In other words, when, as in the present study, alcohol, cigarette and fat consumption, and social isolation factors are taken into account, there is rarely an inverse relation between unemployment and chronic disease mortality rates with a zero lag. (In the case of automobile accident mortality, incidentally, necessary controls would include car ownership and miles traveled per capita.)

Second, we have tested more directly whether being at work represents an increased mortality risk within one year by examining average weekly hours worked in manufacturing industries and age-specific labor force participation rates. In both cases, with a lag of zero (i.e., within a year), decreased average hours of work per week and labor force participation are related to increased mortality. In addition, it was reported above that increased business failure rates are related, for example, to increased cardiovascular mortality rates with a lag of zero (as well as with a two year lag).

It is therefore clear that decreased labor activity, with appropriate statistical controls, poses an increased risk to mortality within one year. At the same time it should be emphasized that these findings are consistent with the research literature indicating long-term (i.e., 10–30 years) increases in mortality risk in specified occupations, especially involving malignancies and chronic respiratory diseases. Further, as has been discussed, during recession the risk of work stress by those who remain employed is also likely to increase due to: (1) threat of loss of income, career, and social contacts, and (2) increased tension and demands for increased productivity, and lower margins for error.

7. Indirect Effects of Recession on Social Pathologies: Experimental Results

The principal objective of this study is to estimate the effects of changes in economic conditions on measures of health and social well-being. To obtain such estimates, it was considered essential to examine the relationships between economic indices (including per capita income, unemployment rates, and business failure rates) and pathology indices, holding constant, or controlling for, those factors which might otherwise influence the pathological indices. For example, heavy alcohol and cigarette consumption were considered control factors.

At the same time, it was assumed that such factors as heavy use of alcohol and tobacco are greatly influenced by situations of extraordinary psychological stress—especially stress that might arise out of economic disturbances. It was further assumed that, at the national level, other factors, especially including increases in real per capita disposable income, would largely be responsible for the trends and fluctuations in overall per capita consumption of these substances.

Our findings tend to confirm the assumption that such factors as alcohol and tobacco consumption per capita should be held constant. First, these control factors were found to coexist with unemployment and business failures as influences on the pathological indices. Second, in several instances, holding the control factors constant appeared to serve the important function of allowing the significant relationship to be measured.

As the major statistical analyses for this project were being completed, it became clear that recession-related factors might exert a substantial influence on the control variables. The implication was that some of the effect of the control variables on the pathological indices was perhaps due in part to the indirect influence of the recession-related factors. Suspicion about indirect effects was aroused when it was found that, in mortality due to cirrhosis, suicide, and homicide, the impact of the unemployment rate was substantially lower than was calculated in the 1976 report, when no control factors were used. In addition, for those causes of mortality, control factors such as alcohol consumption, proportion of the population living alone, and the divorce rate were frequently significant.

Tests were then conducted to ascertain whether several of the control factors were likely to be influenced by unemployment and business failure rates. It was found that, other factors held constant, the unemployment rate was significantly related to increases in cigarette consumption and the proportion of the population living alone. The business failure rate was significantly related to increase in cigarette and spirits consumption, the divorce rate, and decrease in beer and wine consumption. The implication is that the negative influence of cigarette and spirits consumption on, for example, total mortality, and that of divorce and living alone on suicide, probably reflect in part the indirect effects of recession.

Having obtained strong experimental evidence of the indirect effects of recession on pathology, attempts were made to obtain rough estimates of the order of magnitude of these indirect effects on a sample of age-adjusted causes of pathology.

It was estimated that the combined indirect effects of unemployment and business failure rates on total mortality and cardiovascular mortality were approximately 200 and 150 percent, respectively, of the direct effects attributed to the unemployment rate. These examples of indirect effects were due entirely to the positive relationships between both unemployment and business failure rates and cigarette consumption.

The combined indirect effects of unemployment and business failure rates on suicide were approximately 11 times the direct effects attributed to the unemployment rate. These indirect effects are linked to the positive relationships between: (1) business failures and spirits consumption and (2) unemployment rates and the proportion of the population living alone. Spirits consumption and proportion of the population living alone, in turn, are both related to increases in the suicide rate.

TABLE I.—MULTIPLE REGRESSION EQUATIONS FOR AGE-ADJUSTED TOTAL AND CARDIOVASCULAR DISEASE MORTALITY RATES[1]

[Lag in parentheses][2]

Explanatory variables	Total mortality 1950–80	Cardiovascular-renal disease mortality 1950–80	Cerebrosvascular disease mortality 1950–80	Ischemic heart disease mortality 1951–80
Economic:				
Income:				
Real Inc. PC, Exp. trend	−0.146E−2 (0)	−0.918E−3 (0)	−0.337E−3 (0)	−0.372 (0)
Over 65 Inc. ratio	(#)	−1.081** (0)	(#)	(#)
Labor force:				
Unemployment rate	6.011 (3)	5.481 (3)	1.376 (3) (W3)	1.709* (3)
Unemployment rate	6.978 (9–13) (W1)	3.352 (10)	0.084 (9–12)	(#)
L.F. Part. Rate, over 65, annual change	(#)	(#)	−0.943E−2	(#)
Business failure, annual change	(#)	0.626E−2 (0)	(#)	(#)
Business failure, annual change	0.148E−1 (2)	0.121E−1 (2)	0.378E−2 (2)	(#)
Behavioral:				
Cigarettes	0.124E−3 (4–7) (W2)	0.438E−3 (6)	0.142E−3 (7)	0.168E−3 (10)
Spirits	(#)	(#)	0.837E−1 (3)	0.435 (1)
Beer	(#)	(#)	(#)	−0.648E−2 (4–7) (W4)
Wine, annual change	(#)	(#)	(#)	−0.413 (1)
Animal fat	(#)	(#)	(#)	0.167E−3 (1)
Family and household divorce, annual change	0.815 (1)	0.496 (1)	0.882E−1** (1)	(#)
Other controls:				
Rho π	−0.549	−0.533	−0.566	−0.803
Binary var. 1968	(#)	(#)	(#)	0.869*
Binary var. 1979	(#)	(#)	(#)	−0.223
Constant	8.836	5.780	1.162	0.100**
R squared	0.997	0.998	0.999	0.995
F statistics	917.24	1321.840	2395.27	426.200
Durbin-Watson statistic	2.035	2.099	2.290	2.360

π Cochrane-Orcutt Transformation used to minimize residual autocorrelation.

Variable omitted from equation either because of irrelevance or statistical insignificance.

[1] Unless otherwise noted, p is less than .001 for coefficients. * Indicates p is less than .01, ** indicates p is less than .05.

[2] When lags are spread over a number of years the weighted sum of lags are designated in the table as follows: W1 weights = 1,4,3,2,1; W2 weights = 1,2,3,2; W3 weights = 1,5,4,1; W4 weights = 1,5,4,1.

TABLE II.—MULTIPLE REGRESSION EQUATIONS FOR AGE-ADJUSTED CIRRHOSIS, SUICIDE, AND HOMICIDE MORTALITY RATES AND THE INFANT MORTALITY RATE [1]

[Lag in parentheses]

Explanatory variables	Cirrhosis mortality 1951–80	Suicide mortality 1951–80	Homicide mortality 1951–80	Infant mortality 1950–80
Economic:				
Income:				
Real Inc PC, Exp Trend	−0.198E−4 (0)	(#)	(#)	−0.918E−2 (0)
Real Inc PC, annual change	(#)	(#)	−.263E−4 (0)	(#)
AFDC	(#)	(#)	(#)	−.751E−1 (0)
Labor force:				
Unemployment rate	0.256 (9)	0.104* (2)	(#)	32.140 (0)
16–24 Unemployment ratio	(#)	(#)	0.132E−3 (0)	(#)
20–24 male L.F. part. rate	(#)	(#)	(#)	−0.270* (0)
Business failures	(#)	0.150E−3* (1)	(#)	(#)
Behavioral:				
Cigarettes	(#)	(#)	(#)	0.335E−2 (0)
Total alcohol	(#)	(#)	0.767−1 (2)	(#)
Total alcohol, annual change	(#)	(#)	0.392E−1 (3)	(#)
Spirits	0.212E−1* (0)	0.513E−2** (0)	(#)	2.242* (0)
Spirits	0.421E−1 (3)	(#)	(#)	(#)
Spirits, annual change	(#)	(#)	0.156E−1 (2)	(#)
Spirits, annual change	(#)	(#)	0.136E−1 (3)	(#)
Beer ratio	−0.110E−1 (0)	(#)	(#)	(#)
Wine, annual change	0.279E−1* (3)	(#)	(#)	(#)
Narc. arr, annual change	(#)	(#)	0.143E−4** (1)	(#)
Family and household:				
Divorce, annual change	(#)	0.207E−1 (2)	(#)	(#)
Living alone	(#)	0.196E−3* (0)	(#)	(#)
Living alone, annual change	0.776E−3** (1)	(#)	(#)	0.111 (0)
Other controls:				
Rho π	−0.286	0.158	−0.129	−0.497
Nonwhite birth ratio				9.233
Constant	0.161	0.756	−0.132	6.464
R squared	0.984	0.969	0.992	0.999
F statistic	180.848	126.755	354.124	1981.930
Durbin-Watson statistic	2.040	2.041	1.990	2.176

[1] Unless otherwise noted, p is less than .001 for coefficients, * indicates p is less than .01, ** indicates p is less than .05.
π Cochrane-Orcutt Transformation used to minimize residual autocorrelation.
Variable omitted from equation either because of irrelevance or statistical insignificance.

TABLE III.—MULTIPLE REGRESSION EQUATIONS FOR ARREST, IMPRISONMENT, AND PSYCHIATRIC HOSPITAL ADMISSION RATES [1]

[Lag in parentheses]

Explanatory variables	Total arrest rate. 1950–80	Narcotics arrest rate 1951–78	State imprisonment rate 1950–80	Psychiatric hospital admissions rate 1950–79
Economic:				
Income:				
Real income PC, Exp. trend	(#)	(#)	−0.790E–4 (0)	−0.143–2 (0)
Real income PC, annual change	(#)	−0.393 (0)	(#)	(#)
AFDC	(#)	(#)	0.933–E** (3)	(#)
Labor Force:				
Unemployment rate	0.162 (0)	2338.740* (1)	(#)	(#)
Unemployment rate	0.100 (6)	(#)	(#)	(#)
Unemployment rate	(#)	(#)	0.727** (0)	3.897* (1)
16–24 unemployment ratio	(#)	(#)	0.515E–3** (0)	(#)
Nonwhite unemployment ratio	(#)	(#)	0.672E–3** (2)	(#)
16–17 male L.F. part. rate	(#)	7.821* (0)	(#)	(#)
Behavioral:				
Total alcohol	(#)	625.924 (3)	(#)	(#)
Total alcohol, annual change	0.497–1 (0)	(#)	(#)	(#)
Spirits	(#)	(#)	(#)	0.437* (3)
Spirits, annual change	0.138E–3 (3)	(#)	(#)	(#)
Narc. arrests	(#)	(#)	0.146E–3* (0–1)	(#)
Narc. arrests, annual change	(#)	(#)	(#)	0.114E–2 (1)
Family and household:				
Divorce, annual change	(#)	(#)	(#)	0.517* (0)
Living alone	0.151E–3 (0)	(#)	(#)	(#)
Living alone, annual change	0.493E–3* (1)	(#)	(#)	(#)
Other controls:				
Rho π	−0.615	−0.276	−0.240	−0.252
Endogenous	0.597 (1)	(#)	1.067 (1)	0.277** (1)
Time trend	(#)	(#)	(#)	0.112
Constant	0.896E–2	−2160.110	−0.122	3.840
R squared	0.995	0.984	0.991	0.982
F statistic	555.001	240.026	316.505	166.680
Durbin-Watson statistic	2.246	2.364	2.114	1.984

π Cochrane-Orcutt Transformation used to minimize residual autocorrelation.

Variable omitted from equation either because of irrelevance or insignificance.

[1] Unless otherwise noted, p is less than .001 for coefficients, * indicates p is less than .01, ** indicates p is less than .05.

TABLE IV.—ESTIMATES OF THE DIRECT [1] EFFECTS OF A 10% CHANGE IN ECONOMIC VARIABLES ON THE INCIDENCE OF SOCIAL TRAUMA BASED ON 1980 POPULATION [2]

	Total incidence	Per capita income decline		Unemployment increase		Business failure rate increase		Annual change in business failure		16–24 unemployment ratio increase		Labor force decline	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total mortality	1,986,000	201,850	1.0	24,450	1.2	5,793	0.3	(3)	(3)	(3)	(3)	(3)	(3)
Cardiovascular mortality	1,035,250	150,631	1.5	17,392	1.7	(3)	(3)	4,783	0.5	(3)	(3)	(3)	(3)
Cirrhosis mortality	30,066	1,172	3.7	409	1.3	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Homicide	25,070	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	470	1.9	428	1.7
Suicide	27,640	1,066	3.8	189	0.7	(3)	(3)	(3)	(3)	(3)	(3)	1,300	4.8
Population in mental hospitals	139,543	(3)	(3)	5,885	4.2	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Imprisonment	304,332	7,964	2.6	(3)	(3)	(3)	(3)	(3)	(3)	18,471	6.0	(3)	(3)
Arrests	9,703,000	(3)	(3)	403,830	4.0	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Fraud and embezzlement	240,584	(3)	(3)	8,078	3.4	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Assaults	654,960	(3)	(3)	4,919	0.8	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)

[1] Direct effects only; estimates of indirect effects are discussed in Chapter V.
[2] Equations based on the years 1950–1980.
[3] Relationships not statistically significant or effects too small to be reported.

VI. APPLICATIONS TO ECONOMIC POLICY

The government's need to ascertain the quantitative implications of its economic policies arises because economic policies, deliberate or not, influence the nation's health and social behavior, and because the government has some responsibility for dealing with the problems of physical and mental illness and aggression.

Traditionally, economic policy has not been formulated on the basis of its objective implications for national health and well-being. Yet, to the extent that economic policy influences national economic activity, it has also influenced the nation's social well-being. Although it is usually assumed that high levels of unemployment, lack of economic growth, business failures, and economic inequality are undesirable and have unfortunate implications, the magnitude of these implications has never been clear.

This study, among others, has indicated the importance of economic growth for health and social well-being, the damaging effects of recession and its attendant losses, and the importance of equity considerations. Hardly a national economic policy decision arises that may not affect health levels, since policies that stimulate or curtail economic growth and employment intrinsically affect socioeconomic status and opportunities for social mobility, and consequently, influence health.

Estimation of Social Costs

Social costs are assessed by aggregating the various types of human reactions, such as mental hospital admission, use of primary and secondary health care, or imprisonment. Monetary costs, on the other hand, are calculated on the basis of: (1) the cost of using institutional facilities (prisons, mental hospitals, hospitals, and other medical care or criminal justice system requirements); (2) the cost to the families of the individuals who are ill, have died, or who have received injuries as a result of crime; and (3) the costs to the economy as a whole of debilitated or injured members of the labor force or of those who died of causes related to national economic distress.

In Table IV we provide estimates of the relationship between the principal economic indicators and changes in social pathology measures as they would have applied at specific times in the past. In this procedure, the full equations containing coefficients of the relationships between the economic indices and the various pathological indices were used. The incidence of societal pathologies was calculated for the 1980 population base.

An aggregate incidence was obtained for each of the indices of pathology based on the sum of the age-specific incidences. The age-specific sum was used rather than the incidence derived from a single equation representing either the total crude pathology measure or an age-adjusted measure. This is based partly on the differences in reaction patterns among age/sex subgroups to economic trauma and on the need to control for the effects of national economic changes on the population structure.

Effects of economic policy that can be measured would ordinarily be seen in levels of, or rates of change in, such indices as unemployment, per capita income, and business failures. One method of assessing the impact of future economic policies on social welfare would be a tentative forecast of the level of social pathology that would be related to a specific economic indicator. Such a forecast would be based on the historical record of the statistical relationship between the economic and social indices.

For example, in making a decision about the relative social costs of unemployment rates, one might project the values of mortality rates for specific causes that would be associated with different values for unemployment rates. Whether or not a 7 percent rate of unemployment is considered "tolerable," for example, would depend among other considerations on the estimated associated rate of morality.

It should be emphasized that any inferences about the future impact of economic indicators on social indices are built on the assumption of continuity in historical relationships. Two types of relationships are in fact subsumed, one among several economic indices, and the other between each of the economic indices and each of the several social indices. The relationships themselves are based on empirical research using data covering specific historical periods. In making assumptions about the future of any of these relationships, one must first assume that the structure and stability of the relationship will remain as they were during the period over which they were tested. When significant political and social changes interfere with the strength or stability of the basic relationships, assumptions will be altered.

Nevertheless, inferences about future situations are worthwhile. In the absence of more accurate indications of how economic trauma might inflict indirect social costs, they do provide an indication of social costs and benefits of alternative policies.

Derivation of Monetary Costs

a. Methodological Issues Related to Health Costs

DIRECT AND INDIRECT COSTS

The human costs associated with illness and early mortality are incalculable. Even the economic costs cannot be calculated with precision. Considerable progress has been made, however, in the development of methods for estimating the economic costs that occur as a result of illness or death. These represent expenditures on medical care, including hospital costs and fees for physicians' services and for pharmaceuticals. The indirect costs include both morbidity and mortality costs; morbidity costs reflect loss of working time by the ill or disabled, and mortality costs involve loss of expected earnings due to premature death (*1–5*).

The indirect costs of illness and premature death are calculated on the basis of average age- and sex-specific earnings, provided by the U.S. Bureau of Labor Statistics, as well as on wage supplements. Lifetime earnings, estimated on the basis of these cross-sectional data, take into account that earnings usually increase with age, and are adjusted to account for increases in productivity projected to occur along with economic growth and for varying labor force participation rates according to age and sex.

There is no accurate way to measure forgone productivity due to illness among many women, because the value of household work must be added to earnings. Because there is no market price for household services, the currently used method estimates the cost of replacing household services with person-hours from the labor force (*6*). This method, which is based on time-motion study of housewives and the assumption of labor market replacement of analogous activities, is far from precise. Yet this method is superior to assessment by sample survey of the population's "willingness to pay" for household services, since individual responses would be extremely variable.

DISCOUNT RATE

In order to have a base of comparison with present costs, future costs based on projected earnings must be reduced to their present value, or be discounted. The theory is that costs in the present or near future are more of a burden than those in the distant future. There is agreement among economists on the principle of discounting, but considerable controversy as to the appropriate discount rate to be used in general and in specific circumstances. Indeed, the literature on the discount rate, reflecting this controversy, is extensive and has been reviewed in several contexts (e.g., *7, 8*).

Calculations of the indirect costs of premature death or disability generally use discount rates ranging from 2 to 10 percent. In the present study, for total and cardiovascular illness (based on data for total and cardiovascular mortality rates), we provide a range of cost estimates based on discount rates of 2.5 percent and 10 percent, since the initial cost data have been worked out for these categories (*9, 10*).

INFLATION FACTOR

Another issue in economic cost calculation concerns the value of the dollars projected over time. Typically, adjustment is made in the estimates to account for increases in prices of goods and services. The three approaches taken include calculation of increased costs of medical or institutional care, wage rates, and overall prices based on the rate of inflation as measured by changes in the consumer price index (CPI).

In this study, projected increases in medical care costs are used to deflate direct costs of illness; projected increases in wage rates are used to estimate the indirect costs of expected earnings forgone. The CPI is not used for deflation in the illness or mortality costs, but is used to deflate dollar costs of property crime loss. Original data for 1975 on average wages, medical costs, and detailed elements of the CPI are based on the Social Security Administration II B assumptions (*12*) and the Board of Trustees of the Federal Hospital Insurance Trust Fund Annual Report (*13*). These estimates have been adjusted for the increased CPI, average wages, and rise in medical costs for the years between 1975 and 1980 by data from the Board of Trustees of the Federal Old Age and Survivors Insurance and Disability Insurance Trust Funds (*14, 15*).

PREVALENCE APPROACH

In the economic cost calculation of forgone earnings, this study has adopted the prevalence method of estimation. In the prevalence approach, the medical expenses of all cases prevalent during a particular year are calculated, and indirect costs from future earnings forgone due to mortality are assigned back to that year. It would also be important to know the lifetime costs associated with the incidence of disease, or the cost per new case of disease from onset until cure or mortality. This incidenced-based method of estimating lifetime costs is difficult to calculate.

The difficulty lies in the need to take into account the likely course of a disease; the type, volume, and cost of medical care that is usually used; the severity and duration of illness; and the effect of morbidity and mortality on earnings. Data and knowledge limitations preclude the use of the incidence method in this study. In the future, such incidence-based procedures as have been developed by Policy Analysis, Inc. (*4, 5, 11*) could be adopted. At present, we use the available cost calculations provided in *Health: United States, 1980* (*9*) and *Costs of Disease and Illness in the United States in the Year 2000* (*10*).

b. Cost of Total Illness and Diseases of the Circulatory System

For estimating the costs of total illness and diseases of the circulatory system, we use two alternative estimates for indirect costs, based respectively on a 2.5 percent and a 10 percent discount rate. The 1975 figures are taken from *Health United States, 1980* (*9*) and *Costs of Disease and Illness in the United States in the Year 2000* (*10*). Linking mortality in this study with total economic costs of recession assumes that the impact of recession on direct care and morbidity costs is comparable to its impact on mortality.

For each group, the *Year 2000* and *Health 1980* reports estimated three types of cost in arriving at the economic cost of illness for 1975. These costs were inflated to 1980 levels as follows:

—direct costs of prevention, detection, and treatment were increased to 1980 levels by using the same percentage increase that occurred in estimated personal health care expenditures from 1972-1975 and by adjusting these figures for a 57.69 percent increase in medical care cost between 1975 and 1980.

—indirect costs of disability (morbidity), the lost earnings and value of unperformed housekeeping services resulting from illness, were increased to 1975 levels by the percentage increase in average wages over 1972-1975, and adjusted for a 49.3 percent increase in average wages to 1980.

—indirect costs of premature death (mortality), the present value of expected lifetime earnings or the market value of housekeeping services, were increased to 1980 levels by the percentage increase in average wages over 1972-1975 and again adjusted for a 49.3 percent increase in average wages between 1975 and 1980.

The final step was to link the equation-based estimates of the impact of economic instability on total mortality and on cardiovascular mortality with these estimates of the costs in 1980 of total illness and of diseases of the circulatory system.

Table A in Chapter II provides the proportion of total stress incidence attributed to various kinds of economic indicators; e.g., .023 is the proportion of deaths from all causes related to a 14.3 percent increase in the unemployment rate.

Table B in Chapter II provides dollar costs associated with the changes in stress following the author's 1976 methodology in "Estimates of Selected Economic Costs of Unemployment." For example, if the cost of illness is $366.6 billion in 1980, then the economic loss associated with a 14.3 percent rise in the unemployment rate is $366.6×.023 (billion)=$8,479 million at a 10 percent discount rate for obtaining indirect costs. The same estimate discounted at 2.5 percent yields $11,371 million.

COST OF TOTAL ILLNESS

[In billions of dollars]

	Direct cost	Indirect cost	Total cost
(i) Using 10 percent discount rate:			
1975	118.5	120.4	238.9
1980	186.9	179.8	366.6
(ii) Using 2.5 percent discount rate:			
1975	118.5	204.1	322.6
1980	186.9	304.7	491.6

COST OF DISEASES OF THE CIRCULATORY SYSTEM

[In billions of dollars]

	Direct cost	Indirect cost	Total cost
(i) Using 10 percent discount rate:			
1975	15.9	29.7	45.6
1980	25.2	44.4	69.6
(ii) Using 2.5 percent discount rate:			
1975	15.9	50.4	66.3
1980	25.2	72.3	97.5

One of the measures of social trauma used in this report to indicate the impact of unemployment is suicide. Data used to develop an estimate for the economic cost of suicide in 1980 were originally taken from "The Cost of Mental Illness—1974" (*16*). The economic value of life lost through suicide is based on an estimate of the current market value of future earnings lost because of the suicide. The study mentioned above indicates that the cost of deaths due to mental illness in 1974 was estimated to be $4,942 million. To arrive at the percentage of deaths due to mental illness that are due specifically to suicide, it was necessary to use an earlier study, "The Cost of Mental Illness—1971" (*17*). This study indicates that suicides represent 21.7 percent of the total number of deaths due to mental illness (the study assumes that all suicides were due to mental illness). Applying this percentage, the cost of deaths due to suicide in 1974 is $1,145 million. Because 1975 is used in this analysis as the reporting year for economic costs, the 1974 cost of suicide ($1,145 million) was adjusted for the 26.4 percent increase in average wages between 1975 and 1978, resulting in $1,448 million for 1978.

Another measure of social trauma used in this report to indicate the impact of economic distress is that of utilization of state mental hospitals. Based on data in "The Cost of Mental Illness—1974," the direct care expenditures for hospitalization in state and county mental hospitals were $2,756 million in 1974. First admissions to state and county mental hospitals were 29 percent of total admissions in 1972. The $3,263 million direct care cost in 1975 was adjusted for an increase in medical care cost of 42.19 percent between 1975 and 1979, resulting in a rise to $4,640 million.

Another element in the economic cost of state and county mental hospitalization is the value of the time lost, as reflected in lost wages of individuals in these institutions. "The Cost of Mental Illness—1974" indicates that in 1974, $4,524 million was lost to all patient care activities. In order to find the percentage lost only to care in state and county mental hospitals, it was necessary to use an earlier study, "The Cost of Mental Illness—1971." This study indicates that 54.3 percent of the value of time lost to all patient care for mental illness can be attributed to state and county mental hospitalization. Applying this percentage to the total 1974 cost of time lost to patient care ($4,524 million) yields an estimated cost of $2,457 million of time lost to patient care in state and county mental hospitals in 1974. Similarly, the lost earnings in 1975 were adjusted for a 37.56 percent increase in average wages, equalling $3,610 million.

After adjustment of the 1975 data, the sum of the direct care cost of $4,640 million and the indirect cost of the loss of potential earnings of $3,610 million for first admissions to state and county mental hospitals totalled $8,250 million in 1979. The table below shows the estimates for 1975 and 1979.

COST OF MENTAL HOSPITALIZATION

[In millions]

	1975	1979
Direct costs (of care)	$3,263	$4,640
Indirect costs (lost earnings)	2,624	3,610
Total	5,887	8,250

c. *Methodological Issues Related to Costs of Crime*

MEASURES

Efforts to determine the cost of crime generally consist of assigning money values to the consequences of criminal actions. While, at first glance, estimating the costs of crime might seem relatively simple, there are problems involved in arriving at a figure that reflects either the total of crime or that of specific crimes (*18*).

One critical problem is the lack of agreement among those working in the area as to what should be included in crime cost estimates. Some writers limit their costs to criminal justice system expenditures, while others include property losses, earnings made through criminal activities, or expenses on preventive measures used by people to avoid crimes. Some researchers focus on indirect costs, including losses to society resulting from crime. Others feel that the costs of crime are inherently unquantifiable, especially when one considers the fear of crime and the ways such fear alters people's lives

The fundamental problem is that there are no reliable measures of crime itself—whether it results in reports to the police, death, arrest, imprisonment, or public reactions—for the actual amount of crime in society is unknown and inherently unknowable.

In this report, five types of measurement were considered, related partly to the author's 1976 report. The first is lost productivity (based on forgone earnings) of victims. This measure was used in 1976 to estimate homicide costs, in a manner similar to the cost estimates of other forms of mortality, and is retained in this report.

The second measure is based on the concept of underutilization of imprisoned manpower. The concept is that each inmate is assumed to be capable of earning the mean household income (based on census data) earned by employed members of the labor force with his educational and occupational background. Average earnings derived by this method adjust for the fact that inmates include a larger proportion of nonwhites than the population at large. But no adjustment is made for the higher unemployment rate that would prevail among persons at high risk for engaging in crime and becoming imprisoned (*19*). In addition, data on age-specific incarceration were unavailable after 1973. Because of these problems, the present study does not calculate such costs of imprisonment.

A third measure represents the costs of loss of money and physical property due to property crime. In this report, we use that measure in the estimate of white collar crime.

A fourth measure involves criminal justice system (federal, state, and local) costs and includes expenditures for police protection, courts, legal services and prosecution, indigent defense, and corrections. This measure is used in the present study.

A fifth measure involves the value of illegal goods and services that are the products of organized crime; the vast majority of these are narcotics and dangerous drugs. This measure, in addition to the forgone earnings of victims (of homicide), losses due to property crime, and criminal justice expenditures and related costs, was used for the estimate of total crime costs. The estimates are all taken from the Joint Economic Committee figures of 1976. For purposes of estimating economic costs of crime, the following indices were used: (1) homicide, which is only used to account for costs related to mortality caused by homicide; (2) the arrest rate for fraud and embezzlement, which is used as an indicator of white collar crime; and (3) the total arrest rate, which is used as a broad indicator of total crime, and, more narrowly, as an indicator of criminal justice system activity.

DOUBLE COUNTING

It should be pointed out that, because of the difference in measures of crime costs that are used in this study, one must be careful to avoid double counting. For example, the costs of homicide might include those of arrest, court adjudication, and imprisonment of persons responsible; the same costs might also be separately allocated to operation of the criminal justice system. Another common example is the confusion of the costs of drug abuse with those of crime, because of the tendency of the addicted population to use illegal methods to support the drug habit. Because drug abuse usually involves (costs of) crime, it cannot be reasonably added to the costs of crime.

This problem of double counting is most often an issue in crime cost accounting, but is also seen in the estimation of illness and mortality costs. For instance, for the population as a whole, the costs of a high suicide rate might be understood to involve mental hospital treatment of attempted suicides. Such costs attributed to suicide should then not be added to those of mental hospitalization, where the intention is to obtain a broad estimate of the costs of psychological disorder.

d. Cost Estimates for Crime

Though estimates of the cost of crime must rely on a tenuous base of information, the cost is clearly enormous. The direct costs of crime, its control, and prevention are massive. When the indirect costs resulting from loss of life, loss of income, and higher costs of goods and services are added, the costs rise even higher. From time to time, various agencies of government have tried to measure the economic impact of crime. In 1976, the Joint Economic Committee of the United States Congress published an estimate of the cost of crime that exceeded $125 billion per year (*20*, p. 26).

HOMICIDE

The economic costs of homicide were estimated by using the 1974 homicide statistics collected by the Division of Vital Statistics of the National Center for Health Statistics (*21*) and the Social Security Administration's estimates of lost earnings from death (*12*). Based on a conversion of the 1972 earnings into 1975 figures, it was found that the estimated 1975 economic cost of homicide mortality would have been over $5,406 million. This estimate was then adjusted for a 49.3 percent increase in wages between 1975 and 1980. The 1980 economic cost of homicide mortality alone would have risen to $8,076 million.

WHITE COLLAR CRIME

The second index of criminal activity employed in this study is white collar crime. White collar crime is among the fastest growing types of criminal activity. According to the Joint Economic Committee projection of 1976, 35 percent of all crime is attributable to white collar crime. This encompasses, inter alia, bankruptcy, fraud, bribery, payoffs, computer crime, consumer fraud, illegal competition, credit card and check forgery, embezzlement and pilferage, insurance fraud, and securities theft and fraud. The estimated cost in 1976, $44 billion, was adjusted for the CPI increase of 44.8 percent between 1976 and 1980. The outcome is a cost of $63.8 billion in 1980 attributed to white collar crime.

CRIMINAL JUSTICE SYSTEM AND TOTAL CRIME

The arrest rate is taken, in this study, as an indicator of, at a minimum, criminal justice system costs and, at a maximum, total crime costs. The estimated cost of the criminal justice system, representing 18 percent of total crime costs in 1976, was $22.7 billion, according to the Joint Economic Committee Report of 1976. These costs are inflated by 44.8 percent between 1976 and 1980, with a resulting figure of $32.9 billion for 1980.

Overall crime costs, estimated by the Joint Economic Committee in 1976 as $125.2 billion, are similarly inflated by 44.8 percent between 1976 and 1980 to yield a 1980 figure of $181.3 billion.

PROBLEMS IN THE ESTIMATION OF SOCIAL COSTS

This study attempts to provide estimates of the social costs of economic change for both the recent past and the near future (based on projections). First, however, it is necessary to delineate two problems caused by the preliminary nature of our calculations: (1) a comparatively small number of pathological indices that are used to represent "social costs," and (2) the fact that pathological indices measure extremely severe reactions rather than typical effects. These elements point out that we have just uncovered the surface in estimating social costs of national economic distress.

The first problem is the relatively small number of pathological indices examined. The estimates presented here should be taken only as indicative of the great breadth of pathological reactions in the population. Although our present level of knowledge prevents accurate measurement of the full amount of social pathology associated with economic trauma, we can asume that it exceeds the estimates given in this report.

Our second major problem in estimating the overall social costs is the use of extraordinarily severe measures of pathology. These extreme indices can theoretically be extrapolated to the larger conception of mental and physical ill health and criminal aggression. If we wish to estimate the total "human cost" or the monetary cost of the impact of national economic distress in the light of these broad conceptual issues, then we must take into account two additional levels of analysis.

In the case of mental illness, we must extrapolate from mental hospital admission to other forms of general medical care and, finally, to the general mental health of the population, including those who do not receive care. For physical health, we must extrapolate from mortality to hospitalization and the use of primary and secondary health care, and finally, to the general status of the population's health, whether or not medical care is used. In considering aggression, we begin with the extreme indicator of imprisonment, and extrapolate to entrance into the criminal justice system (from arrest through conviction); then we must infer the behavior of criminal aggressors, including those who are not arrested and whose crimes are not reported, and finally extrapolate to the status of the population with respect to the variety of serious aggressive behavior.

Perhaps we have underestimated the impact of these relationships because of data inadequacies, incomplete theoretical formulations, and confinement of the analysis to the national level. The problems of data inadequacy are evident in the case of admissions to mental hospitals and prisons. The count of admissions is probably accurate, but the degree to which hospitalization and imprisonment are reliable measures of serious mental disorder and serious crime will vary with, among other things, administrative policies of these institutions. Thus, the extent of mental disorder and criminal aggression, of which institutionalization is one index, is not only unknown, but may change through time. Moreover, trends in the institutional indices of mental disorder and criminal aggression are probably least sensitive to the effects of economic and social change simply because they display relatively little variability over time in comparison to non-institutional measures.

The problem of incomplete theories with respect to the effects of stress on serious pathology—let alone the effects of economic trauma on stress—have similarly been understated. The basic theories have not been completely worked out, and few studies of these phenomena at the individual level are available for use in national policy analyses. Thus, we have had to make several assumptions about the structure of such relationships on the national level, including a number of non-economic explanations of trends in the pathological phenomena. We do not presently have the data base needed to pinpoint which groups among the populations will be most sensitive to national economic changes, which further restricts the sharpness of our analysis. We are forced to examine large populations, only a small proportion of which actually reacts pathologically.

Still, it should be noted that certain important factors that could have a bearing on types of pathology that individuals might show in response to economic trauma could not be dealt with in this report. Such factors include personality, political or religious persuasion, and previous conditions of poor physical health or mental health.

The relatively consistent findings of the present study appear all the more remarkable in the face of problems associated with data inadequacies, incomplete theories, and aggregate levels of anlaysis. It is therefore conceivable that under more nearly ideal study conditons the relationships would be found to show even greater statistical strength.

We are quite aware, however, that the models offered here are by no means structurally complete. They represent only a second-stage research effort and are based on earlier scientific work in several different disciplines. The translation of theoretical positon and discovery into policy-oriented, empirical models was based on relatively simple assumptions of linear relationships between the economic and pathological indices. These assumptions of linearity are probably imprecise, because they do not take into account the duration and rate of change in economic distress. For example, they assume that a change in the unemployment rate from 2 to 3 percent would have a pathological impact similar to that of a change from 7 to 8 percent. Increases at higher levels of unemployment may have considerably more deleterious effects.

DISCUSSION OF THE FINDINGS BASED ON RECESSION-RELATED INDICES

Unemployment and business failures are the two principal recession-related influences at all ages, judging by total and cardiovascular mortality, but labor force participation rates, hours worked in manufacturing, and annual changes in per capita income are also useful to describe other short-term impacts of recession. Because unemployment often shows a major effect after 2 or 3 years, it is difficult to measure shorter lags using the same unemployment variable. The alternative recession-related indicators may be independent enough of the unemployment rate to allow observation of effects of recession that occur within less than 2 years.

No short-term recession-related relationships were found to occur for cirrhosis mortality. An age-specific income ratio, however, was a significant contributor at all ages to the explanatory model. It suggests that, in the short run, doing relatively poorly constitutes a high risk situation for pathological drinking, or drinking and drug use combined. Also implicated are the stresses of social isolation and the delayed effects of unemployment, which may work to set off the pathological processes that may result in death a decade later.

With respect to homicide, which also lacks a short-term recession-related variable in the multivariate equation, there is probably another aspect of relative deprivation at work. All other indices of crime, it should be noted, are highly recession-related. With homicide, however, the unemployment variable is the youth unemployment ratio, not an indicator of recession. We interpret this to mean that the youth respond violently to a situation of sharp contrast between comparatively good societal economic conditions and their own chronic unemployment or underemployment with little prospect for improvement.

A final observation is in order on the interpretation of the recession indicators in the context of multivariate analyses. Because many factors are required to develop acceptable empirical models of hypothesized relations between recession-related loss and pathological response, it is not possible to consider the effects of any isolated variables. For instance, although a 10 percent increase in the unemployment rate may be associated with a 5 percent increase in mortality from some cause, it does not follow that one can see exactly a 5 percent change in the vital statistics a year or two after the rise in unemployment. Many other trends and changes are at work simultaneously, either to raise or lower the actual rate. Only if other trends and changes were somehow controlled could the unemployment effect be isolated.

RESEARCH PRIORITIES

Our findings further corroborate earlier research on the statistical effects of economic declines on measures of social pathology. They also confirm the tradition of research on the inverse relationship between socioeconomic status and pathological consequences of economic distress. The research in this paper allows the problem to be evaluated in terms of economic distress originating at least partly at the national level. The implication is that substantial components of societal stress originate with economic maladjustments that, in turn, can be moderated through national economic policy actions.

It is hoped that this effort will encourage research on the impact of economic policy on societal well-being. Solutions to many of the major problems found in the work presented here will doubtless be found as research proceeds on the national and urban levels. It is probably to the urban level, particularly, that we need to look for a determination of the negative effects of long-term growth in economic affluence. It is on the urban level, moreover, that the largest differences in unemployment rates prevail. It is clear that we need to examine these relationships by comparing cities, states, industries, and occupational groups.

Comparisons should also be made at the international level. Extension of this comparative research to other countries will bring us closer to understanding the sources of pathological response to changes in economic conditions.

Finally, a research priority is the determination of which components of economic growth have the most impact on the indices of societal well-being. For example, it would be important to determine what proportions of declining mortality are statistically related to increased availability and use of medical technology, to nutrition, or to the general decline in the physical and emotional stress of work life. It would also be important to break down the components of the CPI to determine whether price increases of specific goods and services are most responsible for the pathological effects or, in fact, whether it is the implication of changes in the income structure (related to changes in price levels) that is behind the relationship of inflation rates and pathology indices.

Refined applications that go beyond the use of the broad findings of the present report require far more extensive analysis. Such research can be undertaken in both the national and subnational (even individual) levels of analysis. Efforts should be made to study populations that tend to undergo substantial economic difficulty that is heightened by national economic adversity. This is especially true of many urban centers in the United States, where serious pathological problems as well as high unemployment and relative economic decline have coexisted in recent years. In addition, age, racial, occupational, and industrial groups that are particularly vulnerable to the instabilities in the national economy represent a priority for substantial study, as it could provide the basis for targeting specific ameliorative economic measures to populations where they would provide the greatest benefit, in terms of both effectiveness and efficiency.

It is also important to evaluate the effects of non-economic ameliorative programs on the physical health, mental health, and criminal justice areas in light of national, regional, and local economic trends. It may be that, in many instances, the ameliorative programs are overwhelmed by the effects of the economic trauma and can only prevent greater pathology.

Well-designed research at the individual level should help to identify how strongly different kinds of economic trauma affect the tendency toward serious physical and mental health pathologies and aggression in the population. For example, population cohorts could be followed and intensively examined over periods of several years to ascertain the effects of the economic changes specific to their lives, as economic changes tend to be associated with specified pathological conditions.

Studies of the relationship of economic change to societal pathologies in individuals have often lacked controls for other risk factors, focused too narrowly on employment status, and been inadequate in size of sample. Research over the past several years has shown that it is critical to consider the established risk factors for specific pathologies, such as the controls in the present study for cigarette smoking and alcohol consumption in the analysis of chronic disease mortality. Research has also revealed the pervasive effects of economic conditions in a family, work organization, community, or region. Because recession-related losses are felt not only by the unemployed, but by their families, former co-workers, and neighbors, a comparison should be made between persons in regions or communities differentially affected by economic changes, not just between the unemployed and the employed. These analytic considerations will require large sample sizes if the results are to be statistically meaningful.

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APPENDIX A—METHODOLOGY

ANALYTIC TECHNIQUES

The statistical analyses in this study were performed using the Time Series Processor (TSP) computer programs for multivariate time-series regression analysis. Standard statistical procedures for analyzing multiple variables were used. Routine tests for significance of individual variables and of complete equations are shown in the tables. The Durbin-Watson test for autocorrelation of residuals is also reported. Since it was found useful in all cases to transform the data to minimize serial correlation, the Cochrane-Orcutt procedure was employed for this purpose; rho values are included in the tables.

Despite the theoretical strength of the models under study, in many instances specific variables were not found statistically significant. Of these, several were omitted in the final equations because: (a) their t values are near zero, (b) their presence as statistical controls is not required, and (c) their presence tends to damage the statistical significance of the overall equations (F or DW values). Several other variables whose t values are greater than zero, but not technically significant, were retained in the final equations if: (a) they are needed for statistical control and (b) their presence does not damage the statistical significance of the overall equations.

DATA SOURCES AND LIMITATIONS

The data are those routinely used in this country for measuring a variety of economic and social conditions at the national level. Sources are listed at the end of this chapter. While generally the analyses cover a time span from 1950 through 1980, exceptions occur on account of variations in the availability of data. Analysis begins later when either the measure of societal pathology or some important control variable could not be obtained for earlier years. Similar problems arise at the end of the period. Analyses of mortality by sex, age, and cause, for example, terminate in 1978 for lack of later cross-classified data. Total mortality and mortality for each cause by age, but not cross-classified by sex, are analyzed through 1980. However, the last two years of the series—1979 and 1980—are data estimated on the basis of a 10 percent sample of death certificates. It is worth noting that such delays in the tabulation and publication of basic national social statistics handicap researchers and policy-makers alike who require detailed current information for analysis and forecasting.

TESTS OF VALIDITY

Total mortality and mortality for each of four causes were examined by 10-year age groups for each sex separately (1951–78) and for the sexes combined (1950–80). Nonwhite mortality in 10-year age groups was analyzed for the period 1950–77. Where possible, e.g., arrests and mental hospital resident patients, each of the other categories of pathology was examined by age group. The purpose of the replications by demographic group and categories of pathology is to validate the findings on basic relationships. To the extent that consistency of results is observed among the many replications for each of the main economic indices, additional confidence may be placed on the validity of the relationships associated with each of the indices.

Two other factors made it desirable to examine the relationships between the economic and social indices by demographic groups. The relationships do, indeed, vary by age, sex and race. Thus, representation of the relationships only by the total rates of the pathological indices can be seriously biased by the influence of a minority of subgroups which dominate the totals (e.g., the age groups over 75 in the case of total mortality, or those over 65 in mental hospital admissions).

A second factor that would cause bias is that changes in the economic indices are often associated with changes in the demographic structure of population. Disaggregation of the pathological indices into age-specific components was used to deal with this problem. Technically, then, specification of the pathological data by age, sex, and race was used to obtain more accurate estimates of the coefficients of pathology associated with the economic indices, and subsequent translation of those coefficients into numerical estimates.

For the most part, however, it was decided not to utilize corresponding age/sex-specific unemployment rates or income measures in the analysis of pathological indices classified by these demographic categories. The most important factor in this decision is that the correlation between fluctuations over time in the national unemployment rate and those in the age- and sex-specific rates is extremely high. This means that, over time, subgroup-specific fluctuations in unemployment rates are virtually indistinguishable from those in the national rates, although the size of the coefficients would probably differ, and the resulting empirical models would be very similar. Furthermore, data for the subgroup-specific unemployment rates did not become available until 1947, which considerably narrows the span of time available for analysis of relations with long lags.

As a test of the assumption that the total unemployment rate and the age-specific unemployment rate would yield very similar results, an appropriate age-specific male unemployment rate was tested in analyses of total mortality for both sexes in ten-year age groups, starting with 25–34, for time spans ending in 1978 and 1980. The test was limited to the shorter lags of unemployment, since the age-specific data are available only beginning in 1947.

From the standpoint of interpretation of the relations between economic fluctuations and pathological indices, the use of subgroup-specific unemployment rates may actually be quite misleading. Not only is there a lack of independence among the subgroups in their unemployment rates over time, but there is a lack of independence among different age and sex groups in their social and economic status because they are bound together in family and other social units. Thus, the economic implications of unemployment or income loss of a breadwinner may be quite substantial for the entire family whose members are of diverse ages and both sexes. A more realistic index of psychological stress due to income loss would be a measure of deterioration in family socioeconomic status, for which data are as yet unavailable.

Apart from the economic interdependency of people of different characteristics is the problem of diffusion among different members of a family of psychological stress generated by economic trauma frequently mediated through only one member's relationship to the economy. For example, for a working wife the emotional stress of unemployment may bring about severe agitation, depression, or deterioration in physical health status. Such conditions might have serious pathological implications for her relationships with family members, friends, neighbors, or other associates. Her husband and children might well become hostile or withdrawn and eventually exhibit adverse patterns of reaction separate from those of the person who initially encountered the economic trauma.

Thus, although the initial mental stress has been encountered by one individual, what results is stress to the entire family or even the larger community. In situations where an entire family is undergoing stress initiated by the actions of one of its members, it is often difficult to predict which of the members will actually show the most serious pathological reaction. The probability of pathological response will depend, at least in part, on the previous mental and physical condition of the individuals involved. To take this problem of diffusion one step further, it may be found that high anxiety levels are generated among workers who are themselves not unemployed, but who observe a high incidence of job loss around them, and then become fearful for their own employment and income.

THE PROBLEM OF CAUSAL RELATIONS

The research techniques utilized in this study are essentially based on statistical correlation and regression analysis. As in all research based on correlation or regression, it is important to state the caveat that one cannot establish causation with these procedures. At most, one can test specific hypotheses grounded on sound theoretical considerations and earlier research findings. In these tests, the hypotheses are either supported or unsupported by the statistical evidence. Even when they are supported on the basis of statistically significant relations, they are not proven since the statistical tests only indicate whether or not the findings may result from "chance" factors at specific levels of probability.

In addition to the problem of lack of causal certainty is the issue of possible spuriousness, even for the relations found to be statistically significant. Regardless of stringent controls, outside influences may have unobservable effects on the relationships. The possibility remains that we have not taken all relevant factors into account, especially since the state of our knowledge in the fields involved is incomplete. Thus, some unknown factor may be influencing both the economic trends and those of the pathological indices. Finally, it is probable that the techniques of measurement used in constructing the economic or social indices are not without some error. To the extent that such measurement error exists, our results may be biased.

Having stated the caution on causal interpretation, we should nevertheless point out that the statistical techniques used in this study are standard for the problems encountered, and do not necessarily involve greater error or bias than would be true in other research based on correlation or regression techniques.

ANALYSIS

The pathological indices, or the dependent variables in this analysis, included: total mortality rate (age-, sex-, and race-specific); cardiovascular-renal disease mortality rate (age- and sex-specific); suicide rate (age- and sex-specific); admissions to mental hospitals; patients in mental hospitals (age-specific); imprisonment rate; total arrest rate (age-specific); selected serious crimes known to the police.

From the standpoint of research strategy, we are interested in a single question. What is the empirical relation between economic changes and pathology patterns, holding constant other aggregate-level factors which tend to influence those pathology patterns? To answer that question adequately, it is necessary to select control variables which, on both theoretical and empirical grounds, can help to explain the variance in the pathology patterns that is not appropriately accounted for by the variables which represent economic changes. To the extent that the control variables perform in that classical manner, we will neither overestimate nor underestimate the importance of the economic variables.

It is toward this end that a multivariate operational model of the relation between national economic changes and mortality rates has been developed over the past several years. Theoretically grounded in the epidemiologic, demographic, and stress research literatures, the regression model includes factors associated with: (1) long-term growth in the economy; (2) economic instability—especially recession as indicated by unemployment, income loss, business failures and recession-related declines in average weekly hours worked in manufacturing industries; (3) physical environmental disturbances; and (4) deleterious behavioral risk factors historically associated with economic growth—especially alcohol and cigarette consumption per capita and measures of social isolation, such as divorce and living alone.

LAGGED ENDOGENOUS VARIABLES

Mental hospital admission, mental hospital resident patients, imprisonment, arrests, and crimes known to the police all involve institutional intervention in the process that links incidence of initial pathology to official recording of the occurrence. These mental health system and criminal justice system interventions impose trends and cycles of their own on demographic changes in the recorded data. It is these intervention-based trends and cycles that frequently give institutional data "self-generating" properties. These properties in turn are measured by the lagged endogenous variable. Lagged endogenous variables were utilized to measure the trend of cyclic patterns of institutional activity in all cases where factors involved a "system" response to a specific pathology, intervening between the incidence of pathology and its offical record.

ANALYSIS OF LAG RELATIONS

Analysis of the lag structures of each of the time-series relations was accomplished in the following four stages: (a) theoretical specification of the relevant time span over which the relation may lag; (b) estimation of the actual range of statistically significant lagged relations; (c) narrowing of the range of significant lagged relations under conditions of multivariate statistical controls; and (d) selection of the optimum lag, within previously determined range, under multivariate controls.

The last stage, selection of the optimum lag, is the most difficult since, in fact, the relations usually take place over several years and the "optimum" lag is either the strongest or the average. The ideal procedure, when degrees of freedom permit, is to express the relations in distributed lag form, typically polynominal. This method can be used if we find the number of independent variables to be relatively small, i.e., under six, for a given equation. In the case of this study, however, the combined number of independent variables and controls precludes the use of the polynominal distributed lag method due to insufficient remaining degrees of freedom.

In order to illustrate points (a) and (b) of this procedure, let us take, for example, the case of the unemployment rate in its theoretical relation to the general mortality rate. We can specify, theoretically, that three periods are involved in this relation, covering an overall span of sixteen years. The first period—involving the fear and shock of major economic loss—covers less than two years including the zero year and the first lagged year. The second period covers the span of post-recession depressed employment, which typically last 2-3 years following an "ordinary" recession, and 3-5 years following longer and deeper recession, and culminates in economic reintegration. But, for the population over 40, reintegration probably occurs only with another loss in socioeconomic status. The third and fourth periods are those in which vulnerabilities arising from the first 1-5 years of economic loss and illness result in subsequent illness and mortality. These vulnerabilities are greatly compounded by the occurrence of a new recession.

In this example, we have limited ourselves to a total span of investigation of lagged relations covering fifteen years. In the present study, since the total period of analysis is from 1950 to 1980, it is unlikely that we will be able to measure "cyclical" influences of much greater than fifteen years of lag. Empirically it has been observed in previous studies that lags of unemployment of about 7-15 years have tended to show positive relations to general mortality rates. As a result of those earlier findings, we can, in the present study, take the theoretical position that a principal factor underlying the existence of those two relations is the vulnerability to future episodes of loss and illness of people who have once experienced major loss and illness, especially as engendered by the cyclic movements of national economic activity.

During the present study, it was again confirmed that patterned relations do exist between the unemployment and mortality rates at lags of greater than five years, and that the range of these lagged relations is 7–15 years. Further, the peak lags within this range were found at approximately 10–11 years. The hypothesis was then once again entertained that it is specifically vulnerability to subsequent recession that tends to account for the peak lags, beyond five years, of the unemployment-mortality relationship.

An examination was then made of the average distances between recessions in the post-War period as they are recorded in the Business Conditions Digest. It was found that there tended to be a range of 10–11 years that is, indeed, so regular as to give the appearance of a true periodicity of recessions at roughly each decade (i.e., 1949, 1960, 1970, 1980). These findings provided empirical support for the view that the peak ranges and, especially, the peak lags in the unemployment-mortality relation actually reflect vulnerabilities to the trauma of recession that are engendered by the experience of past recessions.

Subsequent analysis, nevertheless, determined that the peak lags of approximately 10–11 years in the unemployment-total mortality relation were clearly part of a longer distributed lag process. This distributed lag process ranges over the entire span of 7–15 years. It is evident that part of the reason for the relatively long span of lagged relations in total mortality is that it describes a compositional effect which reflects different lag patterns among categories of mortality which have different chronic disease causes. Thus, the cirrhosis of liver mortality-unemployment relations, over the long term, tend to peak at approximately 9 years while cardiovascular mortality does so at 10–11 years (and subcategories of cardiovascular disease, by age, also vary somewhat in their peak long-term lag).

STABILITY OF THE RELATIONS

It is a matter of concern in time series analysis that relations be relatively stable across the time span of analysis. To the extent that the relations—which can be understood as average relations—are unstable, they will be less appropriate for explanation of variance, over any intervening span, or for forecasting. Also, it is reasonable to test the basic explanatory equations and especially the theoretically crucial variables, for time spans that are not covered by them.

The principal explanatory equations were therefore tested for internal 1950–1980 stability through the Chow test. This test splits the period in two—i.e., 1950–1965 and 1966–1980—and compares the resulting two fitted equations according to the magnitudes of their coefficients. Equations explaining mortality rates for the nine principal age groups (infants, 1–14, 15–24, 25–34, 35–44, 45–54, 55-64, 65–74 and 75 and over) were analyzed in this way. The result was that no significant difference could be found between the two periods in the coefficients of the economic variables and almost all other variables. The only exceptions were that in two age groups specific control variables had to be removed from the equations in order to achieve stability for the economic variables. For 15-24 year old mortality rates cigarette consumption, divorce rates and the proportion of the population living alone were removed; for 65-74 mortality rates, spirits consumption was removed.

Additional tests were performed using equations which were initially fitted to 1950-1980 over the periods 1960-1980, for each of the nine groups. In all cases the short-run relations of the mortality rates to recessional indices, especially the unemployment rate, were found at similar lags. For infant mortality the peak lag was zero; for all other age groups the peak lag was at approximately 3 years during 1950-1980 and 1960-1980, and 2-3 years during 1940-1960 and 1950-1970. For three time spans, 1950-1970, 1950-1980, 1960-1980, the longer-term lagged relations between unemployment and mortality rates over age 45 were significant at 7-15 years; for 1940-1960 those relations were significant at 9-12 years.

PRINCIPAL DATA SOURCES

Per capita real income: U.S. Bureau of Economic Analysis. *The National Income and Product Accounts of the United States, 1929-1974;* Survey of Current Business.

Unemployment rates and ratios: U.S. Bureau of Labor Statistics. *Employment and Earnings,* monthly.

Labor force participation rates: U.S. Bureau of Labor Statistics. *Special Labor Force Reports.*

Business failure rate: Dun & Bradstreet, Inc., New York, N.Y. *Monthly New Business Incorporation Report.*

Income ratios—median income of full-time workers with income: U.S. Bureau of the Census. *Current Population Reports,* Series P-60.

Average weekly hours worked in manufacturing establishments: U.S. Bureau of Labor Statistics. *Employment and Earnings,* monthly.

Cigarette consumption per capita:
U.S. Bureau of Alcohol, Tobacco, & Firearms. *Alcohol & Tobacco Summary Statistics.*
U.S. Federal Highway Administration. *Highway Statistics.*

Divorce rate: U.S. Bureau of the Census. *Current Population Reports,* Series P-20.

Female heads of household: U.S. Bureau of the Census. *Current Population Reports,* Series P-20.

AFDC: U.S. Social Security Administration. *Social Security Bulletin.*

Military personnel: U.S. Department of Defense. *Selected Manpower Statistics,* annual.

Crimes known to police: U.S. Federal Bureau of Investigation. *Uniform Crime Reports for the United States,* annual.

Arrest, total and narcotics: U.S. Federal Bureau of Investigation. *Uniform Crime Reports for the United States,* annual.

Imprisonment: U.S. Law Enforcement Assistance Administration. *National Prisoner Statistics,* superceded by *Prisoners in State and Federal Institutions on December 31,* annual.

Mental Hospitalization: U.S. National Institute of Mental Health. *Patients in Mental Institutions.*

Birth rates: U.S. National Center for Health Statistics. *Vital Statistics of the United States,* annual.

Mortality rates: U.S. National Center for Health Statistics. *Vital Statistics of the United States,* annual.

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APPENDIX B—DETAILED ANALYTIC TABLES

STRUCTURE OF THE APPENDIX TABLES

Each of the Appendix Tables 1–33 describes one time series regression equation showing the relation between measures of economic change and indices of pathology, holding constant other risk factors for health and social pathology as discussed in Chapter IV on the "Economic Change Model of Pathology." The Appendix tables only represent a fraction of the total regression equations on which this report is based. A full set of detailed tables is available from the author.

Five components are included in the Economic Change Model: (1) the exponential trend in real per capita income, (2) economic instability, (3) economic inequality, (4) adaptational error associated with economic growth, and (5) random shocks.

As reported in the Appendix tables, the outstanding statistical relationships are grouped in a manner by which they can be identified with the five components of the Economic Change Model. In the Appendix tables, four major categories of variables are found: Economic, Behavioral, Family and Household, and Other Controls. The Economic variables in the Appendix tables include the Economic Change Model categories of: (1) the exponential trend in real per capita income, (2) economic instability, and (3) economic inequality. The Behavioral and Family and Household variables include those which in the Economic Change Model occur under (4) adaptational error associated with economic growth. Other Controls in the Appendix tables include the Economic Change Model Category of (5) random shocks. Other Controls also include the variable rho, which is derived from the Cochrane-Orcutt procedure for minimizing autoregression among residuals.

To the immediate right of most of the variables, and in parentheses, is the designation of the duration of lag in the relationships. The lag is in years (either the peak years of the relations or the range). If the range is designated, rather than the peak, the relation is distributed over the years identified. For example (7–15) describes lagged relations distributed over an entire 7–15 year period; the coefficient and related statistics refer to the unweighted sum of the lagged relations. In those cases where no lag is designated in parentheses, the relation has been tested only at zero lag and is therefore only significant at that lag (i.e., for the exponential trend in real income per capita and the age/sex-specific labor force participation rate).

The independent variables are used in one of three forms: rates, annual changes (of rates), and ratios. If neither annual changes nor ratios are actually stated in the variable name then the independent variable is in rate form—i.e., even if the term rate is not stated. Annual changes refer to the year-to-year arithmetic changes (or "first differences") in the independent variables. Ratio variables either refer to measures of economic inequality or to alcohol consumption. Ratios designating economic inequality are: (a) ratios of age/sex-specific unemployment rates to total population unemployment rates or (b) ratios of age-specific median family income. Alcohol consumption ratios may be stated for specific beverages (spirits, wine or beer), and refer to the proportion of total per capita consumption of alcohol that is attributed to the per capita consumption of any one beverage.

The sequence of presentation of the tables is by major topic—i.e., total mortality, cardiovascular-renal disease mortality, cirrhosis mortality, suicide mortality, homicide mortality, state and county mental hospital resident patients, crimes known to the police, and arrests. In the full set of detailed tables all major topics are subclassified by age and where possible by sex; total mortality is separately analyzed for the non-white population. On occasion, more than one table (and thus more than one equation) will be presented for specific dependent variables. Where (1) different expressions were nearly equally effective from a statistical viewpoint, and (2) demonstrated the theoretical importance of specified explanatory or control variables, more than one equation is represented.

APPENDIX TABLES

Titles	*Table*
Total Mortality Rate, 1950-1980, by 10-year age groups	1-6
Cardiovascular-renal Disease Mortality Rate, 1950-1980, by 10 year age groups	6-12
Cirrhosis Mortality Rate, 1951-1978, Male, 45-54 and up	13-15
Suicide Mortality Rate, 1951-1980, Total, age 15-24 and 45-54	16-17
Suicide Mortality Rate, 1951-1978, Male, 45-54 and 55-64	18-19
Homicide Mortality Rate, 1951-1980, Total, 1-14 and 15-24	20-21
Homicide Mortality Rate, 1951-1978, Male, 15-24	22
State and County Mental Hospital Resident Patients Rate, 1950-1979, Total, Age 25-44 and 45-64	23-24
Crimes Known to the Police, 1950-1980, By Crime	25-30
Arrest Rate, 1950-1980, Total, Age 18-24 and 25-34	31-32
Fraud and Embezzlement Arrest Rate, 1950-1980, Total Population	33

TABLE 1.—MULTIPLE REGRESSION EQUATION FOR TOTAL MORTALITY RATE, AGE: 35-44—UNITED STATES, 1950-80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: Real income PC, exp. trend	−0.776906E−03	−11.6
Labor force:		
Unemployment rate (2)	2.231	2.188
Unemployment rate (7-15)	1.130	5.049
Behavioral:		
Cigarettes (4-8)	.179E−03	5.519
Spirits (0)	.251	2.616
Family and household: Living alone, annual change (0)	.651E−02	2.046
Other controls:		
RHO	.556	3.66
Constant	1.156	2.514

R-Squared = 0.905
Adjusted R-Squared = 0.88
F-Statistic (6., 23.) = 28.464
Durbin-Watson statistic = 1.794

TABLE 2.—MULTIPLE REGRESSION EQUATION FOR TOTAL MORTALITY RATE, AGE: 45-54—UNITED STATES, 1950-80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: Real income PC, exp. trend	−0.143E−02	−17.445
Labor force:		
Unemployment rate (2)	5.0104	3.429
Unemployment rate (7-15)	1.7	7.445
Business failure (0)	.695E−02	2.775
Behavioral:		
Cigarettes (4-8)	.192E−03	5.914
Spirits (0)	.534	3.726
Family and household: Living alone, annual change (0)	.148E−01	2.424
Other controls:		
RHO	−.555E−02	−.309E−01
Constant	6.043	11.327

R-Squared = 0.989
Adjusted R-Squared = 0.986

TABLE 3.—MULTIPLE REGRESSION EQUATION FOR TOTAL MORTALITY RATE, AGE: 55–64—UNITED STATES, 1950–80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: Real income PC, exp. trend	−0.31E−02	−13.731
Labor force:		
Unemployment rate (2)	15.48	3.092
Unemployment rate (7–15)	3.873	10.111
Labor force participation rate, 55–64 male, annual change (0)	−.245	−4.232
Manuf. Hours (0)	−.375	−3.667
Business failure (1)	.103E−01	2.199
Behavioral: Cigarettes (4–8)	.626E−03	7.202
Family and household: Living alone, annual change (0)	.535E−01	3.274
Other controls:		
RHO	−.319	−1.846
Constant	27.57	8.384

R-Squared = 0.991
Adjusted R-Squared = 0.988
F-Statistic (8., 21.) = 231.353
Durbin-Watson statistic = 2.11

TABLE 4.—MULTIPLE REGRESSION EQUATION FOR TOTAL MORTALITY RATE, AGE: 55–64—UNITED STATES, 1950–80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: Real income PC, exp. trend	−0.297E−02	−12.545
Labor force:		
Unemployment rate (2)	9.26	2.043
Unemployment rate (7–15)	1.868	2.980
Behavioral:		
Cigarettes (4–8)	.356E−03	3.165
Spirits (0)	.851	2.008
Family and household: Living alone, annual change (0)	.389E−01	2.444
Other controls:		
RHO	.286	1.636
Constant	16.808	10.653

R-Squared = 0.956
Adjusted R-Squared = 0.944
F-Statistic (6., 23.) = 64.525
Durbin-Watson statistic = 1.773

TABLE 5.—MULTIPLE REGRESSION EQUATION FOR TOTAL MORTALITY RATE, AGE: 65–74—UNITED STATES, 1950–80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: Real income PC, exp. trend	–0.732E–02	–16.279
Labor force:		
Unemployment rate (2)	23.190	2.471
Unemployment rate (7–15)	2.667	2.1
Over 65 labor force participation rate, annual change (0)	–.348	–2.307
Behavioral:		
Cigarettes (4–8)	.113E–02	4.407
Spirits (0)	1.546	1.585
Family and household: Living alone, annual change (0)	.912E–01	2.527
Other controls:		
RHO	.121	.665
Constant	33.736	9.052

R-Squared = 0.977
Adjusted R-Squared = 0.970
F-Statistic (7., 22.) = 130.174
Durbin-Watson statistic = 2.032

TABLE 6.—MULTIPLE REGRESSION EQUATION FOR TOTAL MORTALITY RATE, AGE: OVER 75—UNITED STATES, 1950–80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: Real income PC, exp. trend	–0.119E–01	–9.584
Labor force:		
Unemployment rate (2)	77.439	2.767
Unemployment rate (7–15)	8.8468	2.65
Over 65 labor force participation rate, annual change (0)	–1.067	–2.585
Business failure (0)	.105	2.264
Behavioral: Cigarettes (4–8)	.229E–02	4.395
Family and household: Living alone, annual change (0)	.375	3.412
Other controls:		
RHO	.358E–01	.196
Constant	84.719	9.975

R-Squared = 0.953
Adjusted R-Squared = 0.938
F-Statistic (7., 22.) = 60.56
Durbin-Watson statistic = 1.897

TABLE 7.—MULTIPLE REGRESSION EQUATION FOR CARDIOVASCULAR-RENAL DISEASE MORTALITY RATE, AGE: 25–34—UNITED STATES, 1950–80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: Real income PC, exp. trend	−0.204E−03	−21.230
Labor force:		
Unemployment rate (2–3)	.435	11.547
Unemployment rate (5)	.468	9.289
Unemployment rate (10)	.409	10.491
Business failure (0)	.885E−03	6.825
Behavioral:		
Wine ratio (2)	−.112	−4.377
Cigarettes, annual change (0)	.184E−04	2.331
Cigarettes (6)	.609E−04	11.106
Family and household:		
Divorce (1)	.282E−01	6.063
Living alone (0–1)	.104E−02	5.835
Other controls:		
RHO	−.489	−3.074
Constant	.416	28.413

R-Squared = 0.999
Adjusted R-Squared = 0.999
F-Statistic (10., 19.) = 1507.87
Durbin-Watson statistic = 2.191

TABLE 8.—MULTIPLE REGRESSION EQUATION FOR CARDIOVASCULAR-RENAL DISEASE MORTALITY RATE, AGE: 35–44—UNITED STATES, 1950–80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: Real income PC, exp. trend	−0.61E−03	−27.582
Labor force:		
Unemployment rate (3)	1.138	6.368
Unemployment rate (5)	1.007	5.154
Unemployment rate (10)	1.8	19.711
Behavioral:		
Cigarettes, annual change (0)	.153E−03	4.991
Cigarettes (6)	.164E−03	15.176
Spirits ratio (3)	.366	7.401
Spirits (2)	.115	6.097
Wine (0)	−.821E−01	−4.022
Family and household: Living alone (0–1)	.457E−02	8.695
Other controls:		
RHO	−.636	−4.516
Constant	1.183	35.603

R-Squared = 0.999
Adjusted R-Squared = 0.999
F-Statistic (10., 19.) = 1018.12
Durbin-Watson statistic = 2.216

TABLE 9.—MULTIPLE REGRESSION EQUATION FOR CARDIOVASCULAR-RENAL DISEASE MORTALITY RATE, AGE: 45-54—UNITED STATES, 1950-80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: Real income PC, exp. trend	−0.186E−02	−32.949
Labor force:		
Unemployment rate (3)	2.313	5.818
Unemployment rate (5)	2.280	5.318
Unemployment rate (10)	5.013	22.422
Behavioral:		
Cigarettes (0)	.262E−03	7.116
Cigarettes (6)	.515E−03	14.442
Spirits ratio (3)	.602	7.297
Family and household:		
Divorce (1)	.112	4.463
Living alone (0-1)	.114	9.373
Other controls:		
RHO	−.491	−3.086
Constant	3.815	21.592

R-Squared = 0.999
Adjusted R-Squared = 0.999
F-Statistic (9., 20.) = 3008.14
Durbin-Watson statistic = 2.25

TABLE 10.—MULTIPLE REGRESSION EQUATION FOR CARDIOVASCULAR-RENAL DISEASE MORTALITY RATE, AGE: 55-64—UNITED STATES, 1950-80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: Real income PC, exp. trend	−0.348E−02	−22.438
Labor force:		
Unemployment rate (3)	10.212	7.551
Unemployment rate (10)	9.589	14.705
Business failure, annual change (0)	.149E−01	5.184
Business failure, annual change (2)	.227E−01	4.907
Behavioral: Cigarettes (6)	.118E−02	12.336
Family and household:		
Divorce, annual change (1)	.871	5.547
Living alone (0)	.375E−01	7.943
Other controls:		
RHO	−.471	−2.927
Constant	12.550	56.617

R-Squared = 0.999
Adjusted R-Squared = 0.998
F-Statistic (8., 21.) = 1762.11
Durbin-Watson statistic = 2.18

TABLE 11.—MULTIPLE REGRESSION EQUATION FOR CARDIOVASCULAR-RENAL DISEASE MORTALITY RATE, AGE: 65–74—UNITED STATES, 1950–80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income:		
Real income PC, exp. trend	−0.476E−02	−20.435
Over 65 ratio (2)	−4.889	−2.4630
Labor force:		
Unemployment rate (3)	15.284	4.294
Unemployment rate (10)	24.209	13.119
Business failure, annual change (0)	.412E−01	4.891
Business failure, annual change (2)	.258E−01	2.389
Behavioral:		
Cigarettes (6)	.231E−02	8.081
Beer (5)	−.706E−01	−2.038
Other controls:		
RHO	−.451	−2.770
Constant	30.839	25.280

R-Squared = 0.998
Adjusted R-Squared = 0.998
F-Statistic (8., 21.) = 1174.04
Durbin-Watson statistic = 2.233

TABLE 12.—MULTIPLE REGRESSION EQUATION FOR CARDIOVASCULAR-RENAL DISEASE MORTALITY RATE, AGE: OVER 75—UNITED STATES, 1950–80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: Real income PC, exp. trend	−0.116E−01	−12.984
Labor force:		
Unemployment rate (3)	63.157	6.067
Unemployment rate (10)	47.414	7.395
Business failure, annual change (0)	.175	6.482
Business failure, annual change (2)	.180	5.188
Behavioral:		
Cigarettes (6)	.677E−02	7.739
Beer (5)	−1.032	−8.341
Wine (1)	3.694	3.097
Family and household: Living alone, annual change (0)	.170	2.682
Other controls:		
RHO	−.446	−2.732
Constant	96.878	22.651

R-Squared = 0.996
Adjusted R-Squared = 0.994
F-Statistic (9., 20.) = 495.558
Durbin-Watson statistic = 2.280

TABLE 13.—MULTIPLE REGRESSION EQUATION FOR CIRRHOSIS MORTALITY RATE, MALE, AGE: 45–54—UNITED STATES, 1951–78

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: 45–54 ration(1)	−0.160	−2.215
Labor force: Unemployment rate (8)	.557	2.439
Behavioral:		
Spirits (1)	.458	2.192
Wine, annaul change (3)	.127	4.554
Beer ratio (0)	.516E–01	−5.827
Family and household: Divorce, annual change (1)	.126	5.101
Other controls:		
RHO	.748	−4.115
Chem. prod. (1)	.764E–03	3.208
Constant	.961	5.343

R-Squared = 0.995
Adjusted R-Squared = 0.994
F-Statistic (7., 20.) = 436.293
Durbin-Watson statistic = 1.926

TABLE 14.—MULTIPLE REGRESSION EQUATION FOR CIRRHOSIS MORTALITY RATE, MALE, AGE: 55–64—UNITED STATES, 1951–78

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: 55–64 ration (1)	−0.472	−3.277
Labor force: Unemployment rate (8)	.919	2.542
Behavioral:		
Spirits(1)	.129	4.326
Wine, annual change (3)	.111	2.580
Beer ratio (0)	−.525E–01	−3.914
Family and husehold: Divorce, annual change (1)	0.200	5.361
Other controls:		
RHO	−.613	−2.939
Chem. prod. (1)	.949E–03	3.491
Constant	1.225	4.486

R-Squared = 0.994
Adjusted R-Squared = 0.992
F-Statistic (7., 20.) = 328.789
Durbin-Watson statistic = 1.915

TABLE 15.—MULTIPLE REGRESSION EQUATION FOR CIRRHOSIS MORTALITY RATE, MALE, AGE: 65–74—UNITED STATES, 1951–78

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income:		
Real income PC, annual change (0)	−0.907E−04	−2.504
Over 65 ratio (1)	−.297	−2.639
Behavioral:		
Wine, annual change (3)	.907E−01	3.252
Beer ratio (1)	−.255E−01	−2.361
Family and household: Divorce, annual change (1)	.955E−01	3.685
Other controls:		
RHO	.673	4.153
Chem. prod. (1)	.983E−03	5.662
Hepatitis incidence (2)	.103E−02	2.392
Constant	.877	7.054

R-Squared = 0.922
Adjusted R-Squared = 0.895
F-Statistic (7., 20.) = 23.726
Durbin-Watson statistic = 1.750

TABLE 16.—MULTIPLE REGRESSION EQUATION FOR SUICIDE MORTALITY RATE, AGE: 15–24—UNITED STATES, 1951–80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Labor force:		
Unemployment rate (0)	0.146	3.371
Unemployment rate, annual change (2)	0.214	4.251
Behavioral: Total alc. (3)	0.393E−01	4.398
Family and household:		
Divorce, annual change (2)	0.142E−01	2.430
Living alone (0)	0.979E−03	7.728
Other controls:		
RHO	−0.322	−1.624
Constant	−.825E−01	−6.199

R-Squared = 0.995
Adjusted R-Squared = 0.994
F-Statistic (5., 24.) = 845.755
Durbin-Watson statistic = 1.916

TABLE 17.—MULTIPLE REGRESSION EQUATION FOR SUICIDE MORTALITY RATE, AGE: 45–54––UNITED STATES, 1951–80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: Real income PC, exp. trend	−0.125E−04	−5.538
Labor force:		
Unemployment rate (0)	.240	3.398
Business failure (1)	.555E−03	6.073
Behavioral: Spirits ratio (0)	.521E−01	3.194
Family and household: Divorce (1)	.207E−01	2.251
Other controls:		
RHO	−.539	−3.175
Constant	.119	6.775

R-Squared = 0.981
Adjusted R-Squared = 0.977
F-Statistic (6., 23.) = 158.947
Durbin-Watson statistic = 1.988

TABLE 18.—MULTIPLE REGRESSION EQUATION FOR SUICIDE MORTALITY RATE, MALE AGE: 45–54—UNITED STATES, 1951–78

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: Real income PC, exp. trend	−0.546E−04	−7.592
Labor force:		
Unemployment rate (0)	.436	3.594
45–54 unemployment ratio (2)	.307E−03	4.265
Labor force participation rate (1)	−.582E−02	−2.029
Business failure (1)	.618E−03	4.231
Behavioral: Spirits ratio (0)	.114	5.337
Family and household: Divorce, annual change (1)	.373E−01	3.593
Other controls:		
RHO	−.626	−3.839
Constant	.838	2.922

R-Squared = 0.993
Adjusted R-Squared = 0.990
F-Statistic (7., 20.) = 280.118
Durbin-Watson statistic = 2.206

TABLE 19.—MULTIPLE REGRESSION EQUATION FOR SUICIDE MORTALITY RATE, AGE: 55–64—UNITED STATES, 1951–78

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: Real income PC, exp. trend.	−0.584E−042	−21.042
Labor force:		
Unemployment rate (1)	.266	2.292
55–64 unemployment ratio (3)	.308E−03	4.541
Business failure (1)	.426E−03	2.142
Behavorial:		
Family and household: Living alone, annual change (3)	.172E−02	3.473
Other controls:		
RHO	.992E−01	.475
Constant	.482	45.569

R-Squared = 0.973
Adjusted R-Squared = 0.967
F-Statistic (5., 23.) = 145.260
Durbin-Watson statistic = 1.858

TABLE 20.—MULTIPLE REGRESSION EQUATION FOR HOMICIDE MORTALITY RATE, AGE: 1–14—UNITED STATES, 1951–80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income:		
AFDC	0.612E−04	5.826
AFDC, annual change (3)	.509E−04	2.025
Labor force: Unemployment rate (2)	.194E−01	2.451
Behavioral: Total Alc., annual change (0)	.108E−01	4.688
Family and household: Living alone (1)	.714E−04	3.280
Other controls:		
RHO	−.158	−.862
Constant	−.390E−03	−.693

R-Squared = 0.989
Adjusted R-Squared = 0.986
F-Statistic (5., 23.) = 347.841
Durbin-Watson statistic = 1.943

TABLE 21.—MULTIPLE REGRESSION EQUATION FOR HOMICIDE MORTALITY RATE, FEMALE, AGE: 15–24—UNITED STATES, 1951–78

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: AFDC, annual change (3)	0.258E–03	3.486
Labor force:		
Under 25 unemployment ratio (3)	.174E–04	2.842
16–17 labor force participation rate (0)	.646E–03	4.642
Behavioral:		
Total Alc. (2)	.277E–01	7.094
Narc. arrests (0–1)	.115E–04	3.700
Family and household:		
Other controls:		
RHO	–.840E–01	–.438
Constant	–.622E–01	–5.466

R-Squared = 0.991
Adjusted R-Squared = 0.989
F-Statistic (5., 21.) = 448.350
Durbin-Watson statistic = 2.028

TABLE 22.—MULTIPLE REGRESSION EQUATION FOR HOMICIDE MORTALITY RATE, MALE, AGE: 15–24—UNITED STATES, 1951–78

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Labor force:		
Under 25 unemployment ratio (0)	0.332E–03	2.575
16–17 labor force participation rate (0)	.172E–02	3.920
Behavioral:		
Total Alc. (2)	.157	16.817
Narc. arr., annual change (1–2)	.616E–04	2.433
Family and household: Divorce, annual change (0)	.556E–01	3.543
Other controls:		
RHO	–.232	–1.241
Constant	–.381	–8.946

R-Squared = 0.992
Adjusted R-Squared = 0.990
F-Statistic (5., 21.) = 496.723
Durbin-Watson statistic = 1.959

TABLE 23.—MULTIPLE REGRESSION EQUATION FOR STATE AND COUNTY MENTAL HOSPITAL PATIENTS RATE, AGE: 25–44—UNITED STATES, 1950–79

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Labor force:		
Under 25 unemployment rate (3–5)	1.404	5.673
25–44 unemployment ratio (1)	0.117E−02	2.814
Behavioral:		
Total Alc., annual change (1)	.386	2.373
Total Alc., annual change (0)	.443	2.500
Family and household: Divorce, annual change (1)	.178	2.342
Other controls:		
RHO	−.288	−1.620
Endogenous (1)	.583	13.144
Time trend	−.510E−01	−9.917
Constant	1.254	6.904

R-Squared = 0.999
Adjusted R-Squared = 0.999
F-Statistic (7., 21.) = 4873.930
Durbin-Watson statistic = 2.093

TABLE 24.—MULTIPLE REGRESSION EQUATION FOR STATE AND COUNTY MENTAL HOSPITAL PATIENTS RATE, AGE: 45–64—UNITED STATES, 1950–79

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Labor force:		
Unemployment rate (3–4)	0.972	2.685
Unemployment rate (6)	2.692	5.763
45–54 unemployment ratio (1)	.340E−02	2.413
Non-white unemployment ratio (0)	.370E−02	6.910
Behavioral: Spirits, annual change (3)	.101	2.025
Family and household: living alone (0)	.733E−02	2.078
Other controls:		
RHO	−.705	−5.360
Time trend	−.524E−01	−17.405
Endogenous (1)	.856	26.475
Constant	−.213	−.677

R-Squared = 0.9999
Adjusted R-Squared = 0.9999
F-Statistic (8., 20.) = 35453.9
Durbin-Watson statistic = 2.124

TABLE 25.—MULTIPLE REGRESSION EQUATION FOR ASSAULT RATE (CRIMES KNOWN TO POLICE)—UNITED STATES, 1950–80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: Real income, PC, annual change (0)	−0.250E−03	−2.770
Labor force:		
Unemployment rate (3)	4.485	9.806
Labor force participation rate, male 18–19 (1)	.155E−01	−8.432
Behavioral: Total Alc. (0–1)	.477	10.481
Family and household: Living alone (2)	.102E−01	4.952
Other controls:		
RHO	.686	−5.161
Binary var. (1960)	.507	17.196
Endogenous (1)	.635	15.004
Constant	−1.093	−6.157

R-Squared = 0.9998
Adjusted R-Squared = 0.9997
F-Statistic (7., 22.) = 15869.7
Durbin-Watson statistic = 1.977

TABLE 26.—MULTIPLE REGRESSION EQUATION FOR BURGLARY RATE (CRIMES KNOWN TO POLICE)—UNITED STATES, 1950–80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: Real income PC, Annual change (0)	−0.106E−01	−4.919
Labor force:		
Unemployment rate (3)	26.671	3.595
Labor force participation rate, male 18–19 (0)	−.326	−5.453
Labor force participation rate, male 16–17, annual charge (0)	.153	1.936
Behavioral:		
Total Alc. (3)	9.462	3.799
Spirits (2)	2.317	2.213
Other controls:		
RHO	−.211	−1.185
Binary var. (1960)	2.264	3.970
Endogenous (1)	.537	6.029
Constant	2.008	.730

R-Squared = 0.998
Adjusted R-Squared = 0.997
F-Statistic (8., 21.) = 862.948
Durbin-Watson statistic = 2.187

TABLE 27.—MULTIPLE REGRESSION EQUATION FOR LARCENY RATE (CRIMES KNOWN TO POLICE)—UNITED STATES, 1950–80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: Real income PC, annual change (0)	−0.112E−01	−2.922
Labor force:		
Unemployment rate (3)	45.329	2.057
Labor force participation rate, male 18–19 (0)	−.541	−3.651
Behavioral:Total Alc. (3)	17.015	3.693
Other controls:		
RHO	.263	1.496
Binary Var. (1960)	4.806	3.761
Endogenous (1)	.656	6.304
Constant	6.953	.875

R-Squared = 0.987
Adjusted R-Squared = 0.984
F-Statistic (6., 23.) = 233.7
Durbin-Watson statistic = 1.813

TABLE 28.—MULTIPLE REGRESSION EQUATION FOR ROBBERY RATE (CRIMES KNOWN TO POLICE)—UNITED STATES, 1950–80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: Real income PC, annual change (0)	−0.179E−02	−8.055
Labor force:		
Unemployment rate, annual change (0)	3.969	2.961
Labor force participation rate, male 16–17 (2)	.193778E−01	3.76525
Labor force participation rate, male 18–19 (3)	.339E−01	−6.694
Behavioral:		
Total Alc. (0)	1.516	14.015
Spirits (2)	.649	5.874
Family and household: Living alone, annual change (3)	.573E−02	2.396
Other controls:		
RHO	−.730	−5.853
Binary var. (1960)	.184	3.496
Endogenous (1)	.328	8.356
Constant	−2.173	−5.837

R-Squared = 0.999
Adjusted R-Squared = 0.999
F-Statistic (9., 20.) = 3527.64
Durbin-Watson statistic = 2.34

TABLE 29.—MULTIPLE REGRESSION EQUATION FOR FORCIBLE RAPE RATE (CRIMES KNOWN TO POLICE)—UNITED STATES, 1950–80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Labor force: Unemployment rate (3)	0.634	3.736
Behavioral: Total Alc. (1)	.227	9.058
Family and household: Living alone (3)	.481E–02	9.058
Other controls:		
Binary variable (1960)	.495E–01	4.320
RHO	–.893E–01	–.499
Constant	–.573	–16.608

R-Squared = 0.996
Adjusted R-Squared = 0.995
F-Statistic (4., 25.) = 1446.05
Durbin-Watson statistic = 1.909

TABLE 30.—MULTIPLE REGRESSION EQUATION FOR AUTO THEFT RATE (CRIMES KNOWN TO POLICE)—UNITED STATES, 1950–80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: Real income PC, annual change (0)	–0.231E–02	–3.442
Labor force:		
Unemployment rate (3)	8.559	2.665
Labor force participation rate, male 18–19 (1)	–.828E–01	–3.942
Labor force participation rate, male 20–24 (0)	–.154	–3.186
Behavioral: Total Alc. (0)	3.834	5.2
Family and household: Divorce, annual change (0)	.89	2.346
Other controls:		
RHO	–.123	–.681
Binary var. (1960)	.647	3.017
Endogenous (1)	.340	3.228
Constant	12.787	3.598

R-Squared = 0.997
Adjusted R-Squared = 0.995
F-Statistic (8., 21.) = 569.556
Durbin-Watson statistic = 2.023

TABLE 31.—MULTIPLE REGRESSION EQUATION FOR TOTAL ARREST RATE, AGE: 18–24—UNITED STATES, 1950–80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: Real income PC, annual change (1)	−0.232E−04	−2.992
Labor force:		
Unemployment rate (0)	.928E−01	3.043
Unemployment rate, annual change (3)	.722E−01	2.344
Unemployment rate (6)	.926E−01	3.148
Behavioral:		
Total Alc., annual change (0)	.289E−01	2.984
Total Alc., annual change (1)	.363E−01	3.591
Family and household: Living alone (0)	.603E−03	6.801
Other controls:		
Endogenous (1)	.448	5.036
RHO	.507	−3.221
Constant	.234E−01	−6.860

R-Squared = 0.998
Adjusted R-Squared = 0.997
F-Statistic (8., 21.) = 873.129
Durbin-Watson statistic = 2.194

TABLE 32.—MULTIPLE REGRESSION EQUATION FOR TOTAL ARREST RATE, AGE: 25–34—UNITED STATES, 1950–80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Income: Real income PC, annual change (1)	−0.221E−04	−2.554
Labor force:		
Unemployment rate (0)	.124	3.380
Unemployment rate (2–3)	.426E−01	3.068
Unemployment rate (6)	.831E−01	2.548
Behavioral:		
Total Alc., annual change (0)	.313E−01	2.828
Total Alc., annual change (1)	.432E−01	3.883
Family and household: Living alone (0)	.219E−03	5.480
Other controls:		
Endogenous (1)	.555	7.198
RHO	.502	−3.181
Constant	−.109E−01	−5.180

R-Squared = 0.994
Adjusted R-Squared = 0.992
F-Statistic (8., 21.) = 348.126
Durbin-Watson statistic = 2.328

TABLE 33.—MULTIPLE REGRESSION EQUATION FOR FRAUD AND EMBEZZLEMENT ARREST RATE, AGE: TOTAL—UNITED STATES, 1950–80

[Lag, in years, in parentheses]

	Coefficient	T-Statistic
Economic:		
Labor force:		
Unemployment rate (0)	3.23	3.288
Unemployment rate (3)	2.734	2.693
Unemployment rate (6–7)	1.599	2.473
Behavioral: Total Alc., annual change (1)	1.187	3.438
Family and household:		
Divorce (3)	.137	3.876
Living alone (0)	.887E–02	3.773
Other controls:		
Endugenous (1)	.282	2.226
RHO	.154	–.855
Constant	–.979	–6.501

R-Squared = 0.99
Adjusted R-Squared = 0.986
F-Statistic (7., 22.) = 289.776
Durbin-Watson statistic = 2.035